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MASSACHUSETTS;
= No. 113.

STATE FORESTER

Commonwealth of Massachusetts.

REPORT OF THE STATE FORESTER.
STATE LIBRARY

The first annual report of the State Forester covers a period of 11 months. It was established the office did not go into effect until the first of last July. At the time of my appointment I was State Forester for Connecticut, and I could not get relieved from the duties of that position until the 12th of August, when I qualified for the position in Massachusetts. The report which follows covers only the time between the 12th of August and the 31st of December, 1904.

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ANNUAL

REPORT

The act which establishes this office makes it the duty of the State Forester to give a course of instruction to the students of the Massachusetts Agricultural College on the art and science of forestry as may be arranged for by the trustees of the college and the forester. I have arranged with the president of the college, Dr. Henry H. Goodell, sending the sanction of the Board of Trustees, for a course of twelve lectures and two field exercises. Several of these lectures will deal with forestry in general; the others will be devoted to the forest problems of Massachusetts, particularly those which arise in connection with farm wood-lands, these being the most appropriate for the consideration of agricultural students.

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STATE HOUSE DOCUMENT.

OF

HOUSE No. 113.

Commonwealth of Massachusetts.

REPORT OF THE STATE FORESTER.

To the General Court.

The first annual report of the State Forester covers a period of less than six months. The act which established the office did not go into effect until the first of last July. At the time of my appointment I was State Forester for Connecticut, and I could not get relieved from the duties of that position until the 12th of August, when I qualified for the position in Massachusetts; so the report which follows covers only the time between the 12th of August and the 31st of December, 1904.

COURSE IN FORESTRY AT THE AGRICULTURAL COLLEGE.

The act which establishes this office makes it the duty of the State Forester to give such a course of instruction to the students of the Massachusetts Agricultural College on the art and science of forestry as may be arranged for by the trustees of the college and the forester. I have arranged with the president of the college, Dr. Henry H. Goodell, pending the sanction of the Board of Trustees, for a course of twelve lectures and two field exercises. Several of these lectures will deal with forestry in general; the others will be devoted to the forest problems of Massachusetts, particularly those which arise in connection with farm wood lots, these being the most appropriate for the consideration of agricultural students.

This year (1905) the course will be given in February and March; but hereafter it will probably be given in January, in order that special students taking the short winter course at the college may have an opportunity of getting some instruction in forestry. The college has a small wood lot, for which a plan of management will be prepared, with the assistance of the students. While this wood lot is not a typical one, still, it presents some of the problems that the students are likely to meet with in the management of their own properties.

PRACTICAL ASSISTANCE TO OWNERS OF WOODLANDS.

Section 2 of the act provides that the State Forester may, upon suitable request, give to any person owning or controlling forest lands aid or advice in the management thereof, the owner being liable to the forester for the necessary expenses for travelling and subsistence incurred by himself or his assistants. Up to the date of this report fourteen applications for practical assistance have been received. These applications represent an area of approximately two thousand acres. Five of these tracts have been visited, and advice has been given in regard to their management. This included the marking of trees for removal, in improvement thinnings, in order to start the owner on the right track. The winter closed in before more work along this line could be accomplished.

While the act gives the forester no authority on State lands, it does make his services available to the State as well as to private owners. Inquiries have been received relative to this matter from the commission in charge of the Mount Tom Reservation, and I hope that other reservations will follow suit; for practical work of this kind on State lands should be the special duty of the State Forester.

In order to make the offer of the State in this matter better known, a circular letter has been printed, setting forth the conditions under which the work may be done, and it is being distributed among those likely to be interested. A copy of this circular is here given. It is hoped that in response to this circular the advice of the forester will be sought more frequently.

In this connection a plan of co-operation between this office and the United States Bureau of Forestry has been arranged. Applications for practical assistance made to the United States Bureau of Forestry by owners of woodlands in Massachusetts will be referred to the State Forester, or such portions of them as he may be able to take care of. The United States Bureau of Forestry will assist him in the tabulation of data taken in the course of forest work, and he will furnish the Bureau with duplicate copies of such data as may be of value to it. This will mean a considerable saving to the State in the matter of clerk hire. This plan of co-operation was submitted to the Governor by Mr. Gifford Pinchot, chief of the United States Bureau of Forestry, and it received the hearty approval of His Excellency. This plan of co-operation will be of great benefit to both the State and the United States.

[COPY OF CIRCULAR No. 1.]

PRACTICAL ASSISTANCE TO OWNERS OF WOODLANDS, INCLUDING PROSPECTIVE PLANTATIONS.

It is the desire of the State Forester to make the work of his office of as much practical value as possible to the owners of woodlands within the Commonwealth. To this end, as much of his time as other duties will permit is reserved for the owners of woodlands.

Application for practical assistance should be accompanied by a short description of the tract, stating its size, kind of growth, and the distance from city, town or village. Such applications are grouped according to the parts of the Commonwealth from which they come. In this way several wood lots may be examined on the same trip, and the travelling and subsistence expenses of the forester pro-rated among the several owners, making the expenses very light for the individual owner.

As the forester is often in Amherst on official duties, applicants for advice on the management of lands situated in the counties of Berkshire, Franklin, Hampshire and Hampden, are charged travelling expenses from Amherst instead of from Boston, which arrangement makes the services of the forester as available to land owners in the western part of the Commonwealth as to those of the eastern.

In most cases an examination can be quickly made, and

advice given verbally; but if upon examination a written scheme of management is found to be advisable, the forester may, with the consent of the owner, prepare such scheme of management or working plan, and he will consult with the owner as often as may be found necessary in carrying out the plan. The expenses connected with the preparation and carrying out of such a plan are to be borne by the owner, as set forth in the agreement between the State Forester and the owner, a copy of which will, upon application, be furnished to any person owning or controlling woodlands in the Commonwealth.

Unforested lands which the owner desires to plant fall within the meaning of the term woodlands, as used above.

A FOREST MAP.

The State Bureau of Statistics of Labor has been in consultation with the forester relative to the collection of forest statistics for the census of 1905, and I am assured that this census will contain more information about the forests of the Commonwealth than any previous census. A map showing the forest area of the State is to be prepared in this connection. Those in charge of this work have shown a commendable spirit in regard to the matter, and I look for some tangible results from this disposition on the part of the Bureau of Statistics of Labor to help along the work of this office.

THE STATE FOREST NURSERY.

It is specified in the act establishing the office that the State Forester may establish and maintain a nursery for the propagation of forest tree seedlings on such lands as the trustees of the Massachusetts Agricultural College may set aside for that purpose on the college grounds at Amherst. The stock raised in this nursery is to be furnished to the State reservations free of charge, and to private owners upon such terms as the forester may fix; subject to the approval of the Governor and Council. I have met a committee of the trustees and have talked the matter over with them, and this committee has recommended to the trustees that a tract of three acres be set aside for the nursery.

My policy in regard to the nursery is to make it a part of the course of instruction at college. It would be a mis-

take for the State to go into the wholesale raising of seedlings for public distribution, if the nurserymen of this State can be induced to raise forest tree seedlings and sell them at reasonable rates. Heretofore the nurserymen of this State, and in fact most of the nurserymen of the entire country, have been engaged in raising ornamental and shade trees at prices which prohibit their use in forest plantations, and it is likely that the nurserymen of this State will not care to take up a different line of work ; in this event, the nursery will be expanded as circumstances may make it advisable. In regard to the collection and distribution of seeds, for which provision is also made in the act, it has been decided to pursue the same policy as in regard to the nursery. Some seed has been collected for use in connection with the nursery, but, as said above relative to the nursery, it would be a mistake for the State to go into the business of collecting and distributing seeds, if reliable men can be induced to undertake it and furnish seeds at reasonable rates.

THE STATE FOREST LIBRARY.

A library of 141 books and pamphlets has been collected, and they are being arranged and catalogued. Nearly all of these are government publications, and have been presented to this office, so that their collection represents almost no expenditure. It will be my policy to add to this collection from time to time, and to make it available not only for office use, but to all who may wish to use it.

EDUCATION OF THE PUBLIC IN FORESTRY.

Section 2 of the act makes it the general duty of the State Forester to promote the perpetuation, extension and proper management of the forest lands of the Commonwealth, both public and private. Under the provisions here implied, twenty invitations, exclusive of the course at the Agricultural College, to talk or lecture on forestry and kindred subjects, have been accepted. It has been necessary to refuse a great many engagements of this sort, for lack of time, although the value of this kind of educational work is fully realized. Eight of these engagements have already been filled, and the others are for this winter and spring.

THE GYPSY AND BROWN-TAIL MOTHS.

The presence in the Commonwealth of the gypsy and brown-tail moths in large and increasing numbers is a serious forest problem. For this reason I have identified myself with the fight against them that has been carried on in the infested districts this fall. I have spoken before a number of public meetings in regard to their suppression; and I am serving the Massachusetts Association for the Suppression of the Gypsy and Brown-tail Moths in the capacity of secretary-treasurer.

RECOMMENDATIONS.

According to section 5 of the act, the State Forester may include such recommendations in his report as he may deem proper. In view of the rapid increase in number and the consequent increase in destructiveness of the gypsy and brown-tail moths, I recommend to the General Court that, in the interest of the preservation of our forests, it take immediate action toward the suppression of the gypsy and brown-tail moths.

It was my intention to have ready some recommendations in regard to legislation looking toward a better protection of our woodlands from fire, and a reasonable relief from excessive taxation; but both these matters need very careful investigation, in order to get the information necessary to frame effective legislation, as the history of legislation in other States along similar lines abundantly proves. At another time some recommendations along these lines will be made. In the mean time, the various phases of the fire and tax problems are being investigated.

RECEIPTS AND EXPENDITURES.

Section 6 of the act appropriates a sum not exceeding \$5,000, to be expended annually by the State Forester, with the approval of the Governor and Council, in carrying out the provisions of the act; and requiring that a statement of the receipts and expenditures incident to the administration of his office be made in his annual report. Such a statement follows.

Receipts (August to December, 1904).

Cash to the amount of \$8.63 has been returned to this office for travelling and subsistence expenses of the forester, while engaged in practical work for owners of woodlands ; and this amount, together with an itemized statement, has been turned over to the Treasurer of the Commonwealth.

Expenditures.

Salaries of assistants,	\$260 11
Travelling expenses of forester,	66 43
Forest nursery,	67 10
Instruments and drawing material,	88 85
Stationery and typewriter,	151 28
Postage,	31 50
Library,	13 05
Printing,	7 50
Miscellaneous,	6 54
Total,	<hr/> \$692 36

Respectfully submitted,

ALFRED AKERMAN,

State Forester.

HOUSE No. 350.

Commonwealth of Massachusetts.

SECOND ANNUAL REPORT OF THE STATE FORESTER.

To the General Court.

This office was established to promote the perpetuation, extension and proper management of forest lands within the Commonwealth, both public and private. Its activities for the year 1905 are briefly reviewed below, and some notes are included on work or conditions not directly under its supervision, but germane to the general duty of the office.

PERSONNEL OF THE STATE FOREST SERVICE.

There have been two additions to the service during the year. The present organization is as follows:—

ALFRED AKERMAN, M.F.,	.	.	<i>State Forester.</i>
RALPH C. HAWLEY, M.F.,	.	.	<i>Assistant State Forester.</i>
LEVERETT BRADLEY,	.	.	<i>Agent.</i>
WALTER K. FOBES,	.	.	<i>Clerk.</i>

Besides those named above who are regularly employed, an assistant in the woods, or office, is occasionally employed in case of emergency.

COURSE IN FORESTRY AT THE AGRICULTURAL COLLEGE.

The course of lectures provided for in the act creating the office of State Forester was given for the first time in February and March, 1905. Twenty-nine men elected the course.

This course is designed to prepare prospective farmers for the management of their wood lots. It is not designed to fit men for the practice of the profession, which usually takes two or three years of close application after the undergraduate courses have been finished. The course at the Agricultural College would no more fit a man for the practice of the profession of forest engineering than a short course in home sanitation would fit a man to practise medicine. Attention is called to this matter at the present time, because a good many inquiries have been received as to the purpose and scope of the instruction at the college.

PUBLIC LECTURES AND ADDRESSES.

Besides the lectures at the Agricultural College, 32 public lectures, talks and addresses on forestry have been given during the year, making a total of 43 since the office was established. It is believed that these lectures afford an excellent means of awakening and sustaining public interest in forestry; therefore, as many invitations as were consistent with the discharge of other duties have been accepted, but it has been impossible to meet all of the demands. At times dates have been booked over a year in advance.

One of the encouraging features of this line of endeavor is that interests which are apparently widely divergent can find common ground in forestry. This is another illustration of the truth expressed by President Roosevelt, that forestry "touches the republic on almost every side, — political, social, industrial, commercial." Among those applying have been granges, farmers' institutes, firemen's associations, women's clubs, church clubs, boards of trade, town improvement associations, forestry associations and manual training associations.

PUBLICATIONS.

Two bulletins and three leaflets have been published during the year. The first editions of all these, except one, have been exhausted, and they are being revised for second editions. The number of pieces published is 9,300.

THE STATE FOREST LIBRARY.

Numerous additions have been made to the library during the year. Nearly all of these have been gifts, and they represent very little expense. In selecting those works that it has been expedient to purchase, care has been exercised to avoid unnecessary duplication of books already in the State Library, or in the library of the State Board of Agriculture. The library has not only been of great value to the forest service, but many visitors have made use of it during the year.

It is very pleasant to record in this connection the loan, by the Appalachian Mountain Club, of a set of United States Geological Reports, many of which deal with forestry.

THE STATE FOREST NURSERY.

By authority given in chapter 409 of the Acts of 1904, a forest nursery has been established on the grounds of the Massachusetts Agricultural College at Amherst. Through an inexplicable delay on the part of the trustees of the college to act in the matter, work on the nursery did not begin last spring until all the good land available for the nursery had been assigned to other purposes. The only ground left was the worst for a forest nursery that there is on the college grounds. Rather than throw away the seeds that had been collected, the nursery was begun. In spite of the adverse conditions, the nursery will furnish a few thousand seedlings for distribution the coming spring, and some 25,000 in the spring of 1907. The nursery will be expanded until an annual output of 125,000 seedlings has been reached.

PRACTICAL ASSISTANCE TO OWNERS OF WOODLANDS.

The offer of practical assistance which the Commonwealth makes to owners of woodlands has been responded to with alacrity. Forty-six applications have been received; 34 of these, representing 6,545 acres, have been examined by the forester and his assistants, and advice in regard to their proper management has been given.

This, as well as the other branches of the work, has been hindered considerably by the impossibility of the present force to make examination promptly upon application. The owner who is about to cut his timber and who wishes to cut in such a way as to insure reproduction, or the owner who is about to plant and wants advice on the care of seedlings, species suited to his soil, and the like, ought not to be required to wait until a man becomes available. This and other lines of work would become much more effective if sufficient appropriations were made to allow an increase in the number of men employed.

GROWTH STUDIES.

Investigations into the rate of growth and yield of white pine have been begun in collaboration with the United States Forest Service and the Forestry Department of Harvard University. Over 400 stem analyses have been taken, and the elaboration of this data has been begun. This investigation will be of great practical value to this office in the construction of working plans; it will also be of value to lumbermen and owners of woodlands.

TRAVEL.

During the year a record of travel on duty, such as making wood lot examinations, lecturing, investigating problems, etc., has been kept; it is quoted as an indication of the extent of activity of the service:—

	Miles.
State Forester,	7,058
Assistant State Forester,	6,475
Total,	<u>13,533</u>

A FOREST MAP.

As stated in last year's report, the collection of data for a forest map has been undertaken in collaboration with the Bureau of Statistics of Labor. This work is under way. It will not be possible to make a definite report in regard to it until next year.

CO-OPERATION WITH THE UNITED STATES FOREST SERVICE.

The plan of co-operation between this office and the United States Forest Service, which was outlined in last year's report, has continued in force. The plan has proved advantageous to both parties.

OFFICE FACILITIES.

The drafting room of the service, 247A, has been useless since October. The temperature in this room has ranged between 50° and 60°, rarely reaching 60°. It is manifestly unreasonable to expect men to do physically inactive work under such conditions. The consequence is, that plans which should have been completed several months ago are still unfinished.

The matter has been brought to the attention of the Sergeant-at-Arms repeatedly, and once to the attention of the Council; but at this writing nothing has been done to heat the room. This matter should be investigated at once, and if it be impossible to make the room comfortable, sufficient appropriation should be made to rent a room outside the State House.

THE GYPSY AND BROWN-TAIL MOTHS.

The presence in the Commonwealth of the gypsy and brown-tail moths in large numbers continues to be a menace to our forests. During the year the Commonwealth has made provision for work against the moths by appropriating \$330,000, and the appointment of a superintendent to administer the fund. Energetic work has been begun; and, although the situation continues to be serious, those interested in our forests view it with a decided sense of relief.

EXPENDITURES AND RECEIPTS.

As provided in section 6 of chapter 409 of the Acts of 1904, the State Forester may spend annually in carrying out the provisions of the act a sum not exceeding \$5,000. The expenditures have been as follows:—

•

Salaries of assistants,	\$1,918 05
Travelling expenses (not included in co-operative funds),	398 96
Instruments,	658 53
Stationery, office supplies,	669 24
Printing,	198 31
Postage,	118 70
Miscellaneous,	36 74
	<hr/>
	\$3,998 53
Balance on hand,	1 47
	<hr/>
	\$4,000 00

In addition to the above, bills to the amount of \$388.91 remain unpaid, as the appropriation for 1905 was only \$4,000.

Receipts from the United States for services rendered amount to \$189.17, which amount has been turned over to the Treasurer and Receiver-General.

As directed in section 5 of the act above cited, a statement is also made of the amounts received for travelling and subsistence expenses of the forester and his assistants, while engaged in woods work for owners of woodlands, and lecturing, as follows:—

Benjamin S. Blake, Auburndale,	\$0 21
N. I. Bowditch, Framingham,	3 37
Overseers of the Poor, Palmer,	5 85
L. N. Cushman, Hubbardston,	2 30
F. S. Coolidge, Pittsfield,	6 34
R. S. Goldsbury, Warwick,	1 00
Wm. Franklin Hall, Winchendon,	7 01
J. C. Hammond, Northampton,	2 25
J. M. T. Legate, Charlemont,	4 20
City of Marlborough,	1 27
Mattapoissett Improvement Association,	3 56
Pomona Grange, No. 1,	1 25
Pomona Grange, No. 16,	1 55
Men's Union, Worcester,	2 10
North Shore Horticultural Society, Manchester,	1 39
Roland C. Nickerson, East Brewster,	23 10
Frank K. Nash, Williamsburg,	15 70
North Reading Grange, No. 239,	61
Jas. S. Russell, Milton,	35
South Dartmouth Improvement Association,	2 75
W. J. Stone, Worcester,	5 54

W. S. Spaulding, Prides Crossing,	\$0 98
Mrs. John Swann, Stockbridge,	44 74
Turner Hill (estate), Ipswich,	1 50
Tyngsborough Grange, No. 222,	2 75
Vineyard Haven Improvement Association,	3 35
Wachusett Mountain Commission,	5 07
Wheelwright Paper Company, Wheelwright,	2 11
Fiske Warren, Harvard,	2 09
George A. York, New Bedford,	3 05
Total,	<u>\$157 34</u>

On deposit with the State Forester:—

Francis B. Greene, Dartmouth,	\$10 00
Carrie D. Hosmer, Orange,	3 00
Hampshire Pomona Grange, No. 8,	2 00
Total,	<u>\$15 00</u>

THE TAXATION OF WOODLANDS.

There is a great deal of dissatisfaction with the present method of assessing taxes on forest lands. This dissatisfaction is shown by the laws that the different States are enacting along these lines. Pennsylvania has a rebate system; if a private owner will fulfill certain conditions, he receives a portion of his taxes back after they have been paid. Connecticut, Massachusetts and other States also have special laws in regard to the taxation of certain classes of woodlands. For the most part these laws are not operative because they were not carefully thought out. They serve to show the feeling of discontent with the present system, but they do not furnish a satisfactory solution of the problem.

The system, now generally in vogue, of assessing forest lands for the purposes of taxation, provides for the taxation not only of the land but of the growing crop as well. A farmer's wheat crop is not taxed while it is growing. An orchard or a vineyard yields returns in a very few years, but the wood lot is oftentimes taxed for years before any returns come in. Suppose, for example, a piece of land is planted to white pine, which is to be cut fifty years from now. As soon as that pine has reached a size at which it adds any value to the land, the property is assessed accordingly until

it is cut, when it is again put back to the value of the land without the crop. In other words, the present system provides for the taxation of a raw material not only once, but many times. When this raw material is so universally used in our manufactures, such heavy taxation is of doubtful expediency, granting it to be fair, which it is not. It hinders the increase of wealth by taxing it at its source.

So there is dissatisfaction for two reasons: first, the crop as well as the land is taxed, which is not the case with ordinary agricultural crops; and, second, the crop is taxed while it is not bringing in anything, and therefore the owner is not in a condition to pay taxes on it.

Governor Douglas in his inaugural address recommended to the General Court that laws be enacted providing for a fairer method of taxation of forest lands; and a bill was also introduced by private parties. As the General Court did not feel that it had sufficient time to investigate the question thoroughly at the last session, a resolve was passed calling for an investigation of the laws of other States and foreign countries, and the conditions of this State. Pursuant to this resolve a committee was appointed, consisting of the Tax Commissioner, the chairman of the Harbor and Land Commission, the State Forester, three farmers, and a real estate expert. This committee has been hard at work during the summer and autumn. The laws of foreign countries have been collected, translated and carefully examined; those of this State and other States have been gone over thoroughly. It is believed that such a thorough investigation of this problem has never before been made in this country, and the findings of the committee are worthy of the most careful consideration.

It is recommended that the General Court amend the present tax laws in such a way as to relieve the growing timber crop of the unfair burden under which it now labors. This relief must be given, before the average private owner will be disposed to allow his timber crop to stand long enough to reach its productive maturity.

The need of reform along this line is emphasized by the fact that most of the woodlands of the Commonwealth are in the hands of private owners, and the private owner's actions

are influenced largely by self-interest. Although the State may acquire certain lands for State forests, still, the great body of woodlands will always remain in the hands of private individuals. Now, it is to the communities' interest that private holdings should continue to produce, generation after generation, the greatest possible amount of useful material; and the individual owner should be given every reasonable chance to harmonize his interests with those of the community. A reform in our tax laws as applied to woodlands would be a step towards bringing individual and public interest together.

STATE FORESTS.

The Commonwealth ought to extend its policy of park reservation to include genuine State forests. The reservations that have been made so far are distinctly for park purposes; there are, however, considerable areas in these reservations that could be used for timber growing. Portions of the Middlesex Fells and the Blue Hills reservations might be so utilized without any reduction in their value as parks; on the contrary, their park features would be enhanced. The same might be said of Mount Wachusett, Mount Tom and Greylock reservations, the Province Lands on the Cape, and the land surrounding the Clinton reservoir. The land about this reservoir is already being planted by the Metropolitan Water and Sewerage Board. The forest in the Mount Wachusett Reservation is also being improved by the commission which has that reservation in charge. It is to be hoped that all of the boards and commissions having State lands under their charge will follow these good examples, and make the lands that the State owns as productive of forest supplies as is consistent with the purpose for which they were acquired.

But the lands mentioned are small in area, and the State might well follow the precedent established by several other States, and acquire lands for the purpose of growing timber on them. New York has a forest reserve of 1,436,000 acres, and Pennsylvania has acquired 572,000 acres for forest purposes. New Jersey, Connecticut and other States have also adopted reservation policies.

Lands for forest reservations can very often be acquired

at a small cost. A few years ago Connecticut bought 900 acres at an average cost of only \$1.64 per acre; in Massachusetts they could be had for \$5 and under. There are large areas of overgrown, stony, abandoned pastures, cut-over lands that have been burned repeatedly, scrub oak lands and the like, that are in such condition that an individual owner cannot afford to improve them. The State can afford to bring these lands into productivity for the common weal. When once well stocked, the sale of mature timber should not only provide for the maintenance of such reservations, but should return a net revenue into the treasury of the State. Some of the European governments obtain as much as \$4 net per annum from each acre in State forest.

In addition to their use for timber production, such reservations furnish recreation grounds for the people. This use for recreative purposes under reasonable restrictions is not inconsistent with the production of timber. The arguments which caused the Commonwealth to appropriate \$6,380,000 for the metropolitan parks and considerable sums for the other State park reservations, apply in part to the acquisition of State forests.

The educational effect of well-managed State forests is one of their chief advantages. They should, as far as is consistent with their economical management, be widely distributed over the State, in order that they may serve as object lessons in practical forestry.

It is therefore recommended:—

1. That a fund for the purchase and maintenance of State forests be set aside.
2. That revenues from the State forests be added to the fund.
3. That the State Forester be charged with their purchase, care and management.
4. That the State Forester be empowered to accept gifts of land and money for State forests, subject to the approval of the Governor and Council.

Respectfully submitted,

ALFRED AKERMAN,

State Forester.

JAN 1 1908

HOUSE No. 200.

Commonwealth of Massachusetts.

THIRD ANNUAL REPORT OF THE
STATE FORESTER.

PART I. — COVERING THE TIME BETWEEN JAN. 1 AND SEPT.
15, 1906.

To the General Court.

This office has continued its activities, during the time covered by this report, along the lines pursued heretofore. The following pages contain a review of the work done, together with some notes on forest conditions in this Commonwealth and recommendations for their betterment.

Forestry Lectures at the Agricultural College.

Fifty-one students attended the course in forestry at the Agricultural College this year past. The year before there were twenty-nine, making eighty in all who have taken the course. The course deals with the subject in its application to the farm wood lot.

Interest in the study of forestry has been stimulated by the offer of the J. D. W. French prize by the Bay State Agricultural Society, and two prizes for the best essays on the farm wood lot by a friend of the college.

Public Lectures and Addresses.

In addition to the lectures at the Agricultural College, nineteen public lectures on forestry were given during the

year, making a total of sixty-two since the office was established. As in the case of wood lot examinations, the applicants for lectures pay the actual travelling and subsistence expenses of the forester.

The Inter-state Conference at Charlotte, N. C.

An inter-state forestry conference was held in Charlotte, N. C., on March 3. The State Forester was invited to attend and deliver an address on the State forestry work in Massachusetts. The invitation was accepted and the address delivered.

The White Mountain and Southern Appalachian Reserves.

In April the State Forester was appointed on a committee to urge the passage by Congress of the bill to create the White Mountain and Southern Appalachian Forest Reserves. An account of the proceedings at Washington is contained in the report of the Massachusetts delegation to the Governor, which report is here given:—

His Excellency CURTIS GUILD, Jr., *Governor of Massachusetts.*

SIR:— We have the honor to report that the seven gentlemen commissioned by you to represent the Commonwealth of Massachusetts at the hearing in Washington, April 25, before the committee on agriculture of the House of Representatives, in behalf of the bill for the acquisition of lands suited to national forest reserve purposes in the Appalachian Mountains, within the States of Maryland, West Virginia, Virginia, North Carolina, South Carolina, Georgia, Alabama and Tennessee, and the White Mountains, in the State of New Hampshire, were all present at the place and time appointed for the hearing. These representatives were Mr. Theophilus Parsons, Mr. Harvey N. Shepard, Mr. Alfred Akerman, Mr. D. Blakely Hoar, Prof. J. Rayner Edmands, Dr. O. G. Duhamel and Mr. Edwin A. Start. Mr. Shepard was also accredited as the representative of the Appalachian Mountain Club, Mr. Hoar of textile manufactures representing a capital of about one hundred and fifty million dollars, and Mr. Start of the Massachusetts Forestry Association.

The hearing was continued, at the wish of the committee on agriculture, on Thursday, the 26, when all of the Massachusetts

delegation were present except Mr. Parsons and Dr. Duhamel, who were called home by pressing engagements. In addition to the personal presence of the delegation and the petition presented by Mr. Hoar on behalf of numerous manufacturers, letters presenting in the strongest manner the sentiment of the Commonwealth in favor of this measure were filed with the committee on agriculture from yourself, and from Mr. James Richard Carter, Mr. Amory A. Lawrence and Mr. Charles A. Stone, who were unable to accept your request to be present in person as members of the delegation.

Other States officially represented, through commissions appointed by their governors, were Maine, New Hampshire, Rhode Island and Connecticut; North Carolina, South Carolina, Georgia, Maryland, Virginia, West Virginia, Tennessee and Alabama.

The American Forestry Association was likewise represented by prominent directors from Pennsylvania and the District of Columbia. The Governors of New Hampshire and North Carolina headed the delegation from their States, and Gov. R. B. Glenn of North Carolina acted as chairman of the united delegations, Mr. Start of Massachusetts serving as secretary.

The speakers on behalf of the measure on Wednesday were Gov. John McLane of New Hampshire, Mr. Theophilus Parsons of Massachusetts, Maj. Augustine T. Smythe of South Carolina, Prof. L. C. Glenn of Vanderbilt University, Tennessee, Dr. E. A. Smith, State Geologist of Alabama, and Prof. J. H. Stewart, director of the Agricultural Experiment Station of West Virginia. At the second session on Thursday the speakers were Dr. E. E. Hale, Mr. C. C. Goodrich of Connecticut, Mr. Watson, Commissioner of Agriculture of South Carolina, Mr. Shepard of Massachusetts, and Governor Glenn of North Carolina, who closed the case for the petitioners both north and south.

The presentation was so arranged as to bring out through experts the varied interests involved: the manufacturers, who are dependent on the water power conserved by the mountains in which the proposed forest reserves lie; the transportation interests on the rivers, which are endangered by silting carried by the wash from denuded areas; the agricultural interests in the measure; its importance for the preservation of the most important health and recreation resorts east of the Mississippi; and the necessity of perpetuating the lumber supply in a region adapted by nature for that and no other production. The argument was wholly from the practical and economic standpoint, except when Mr. Shepard presented, with a clearness and force that brought spontaneous applause, the real significance of the argument for health and for recreation, and the true meaning

of the argument for sentiment along these lines. Governor Glenn's closing argument was a powerful summing up along all the lines presented by the preceding speakers.

The delegation was received Wednesday afternoon by President Roosevelt, who pronounced himself heartily in favor of the proposed legislation. After the session on Thursday the delegates were pleasantly received by the Speaker of the House of Representatives.

The general impression among members of Congress and others who are in close touch with the situation in Washington is that an excellent impression was made upon Congress by the delegation, and members of the committee have led us to anticipate a favorable report of the measure at an early day. The bill is already before the Senate, supported by a favorable report from the committee on forest reservations, whose chairman, Senator Brandegee of Connecticut, has it in charge in that body. We are assured that it is likely to pass the Senate without much opposition. A continuance of evidence of the urgent desire for the passage of the measure by the people of the eastern States seems likely to secure its passage.

Respectfully submitted for the Massachusetts delegation,

THEOPHILUS PARSONS, *Chairman.*

EDWIN A. START, *Secretary.*

Publications.

As rapidly as information about the forest problems of the Commonwealth is gotten together, it is published in concise form for the use of woodland owners and such other citizens as may take an interest in forestry.

These publications have not only been in demand in this State, but requests for them have come from other States and foreign countries. The publications to date are as follows:—

"Forestry in Massachusetts,"	Bulletin No. 1
"Forest Thinning,"	Bulletin No. 2
"Report of the Committee of 1905 on the Taxation of Forest Lands,"	Bulletin No. 3
"Practical Suggestions for the Massachusetts Tree Planter,"	Bulletin No. 4
"Forest Fires,"	Bulletin No. 5
"Arbor Day,"	Leaflet No. 1
"Shade Trees,"	Leaflet No. 2
"Forestry and the Schools,"	Leaflet No. 3

The number of copies published amounts to 35,000.

The report on the taxation of forest lands was first printed as House Document No. 134. Requests for copies were so numerous that the supply was soon exhausted. Later it was published as a bulletin of this office.

Correspondence.

Numerous inquiries about forestal matters have been received through the mails. Every effort has been made to answer inquiries in bulletins and leaflets, in order to keep the correspondence from absorbing an undue amount of time. In spite of this, inquiries had to be answered by letter at the rate of 2,500 per annum.

The State Forest Library.

Gifts of books and pamphlets continue to come in. Callers who desire to consult these works are always welcomed and assisted in every way possible.

Practical Assistance to Owners of Woodlands.

Fifty-five applications have been received to date. Forty-seven of these, representing 9,357.53 acres, have been examined, and advice as to treatment and management has been given. This advice is embodied in a written report to the owner. In seven cases a forest map has been constructed to accompany the report.

Wood lot examinations are made at the owners' expense, as provided for in chapter 409 of the Acts of 1904. This line of work is regarded as the most important undertaken, and as much time as can be spared from other duties is devoted to it.

The State Forest Nursery.

The State forest nursery is on the grounds of the Agricultural College, at Amherst. The site has been changed to one more favorably located than the one used last year. Seedlings from the nursery are distributed at cost prices to owners who are operating under a systematic planting plan.

The distribution is made in the order of application. This spring past the distribution was at the rate of \$3 per thousand seedlings, as follows:—

Fred. A. Smith, Ipswich, 2,450 chestnut,	\$7 35
J. M. Tyler, Amherst, 2,000 chestnut,	6 00
George A. York, Marston's Mills, 100 red oak,	30
	<hr/>
	\$13 65

The stock of seedlings on hand is as follows:—

White ash,	90,000
White pine, 1 year,	45,000
White pine, 2 year,	650
Red spruce,	15,000
Beech,	1,200
Yellow poplar,	130
Oak,	100
Hickory,	70
	<hr/>
Total,	152,150

Volume Tables.

The collection of data for the construction of volume tables for white pine was begun in the fall of 1905.

Measurements of more than 1,300 white pine trees were taken, and these have been elaborated, with the assistance of the United States Forest Service. The result is a set of volume tables that are the most complete and accurate that have been prepared in this Commonwealth or in this immediate section.

Mr. Ralph C. Hawley, M.F., assistant in this office, had charge of the execution of this piece of work, and credit for its success is due to him.

The purpose of this work is to devise an easy way to ascertain the quantity of lumber in standing white pine trees. It is easy to measure the amount of lumber in a felled tree, but to estimate standing timber requires more experience than is possessed by the average owner; this is particularly true in the case of the small owner. Volume tables, *i.e.*, tables giving the contents of different-sized trees, afford a means of easily approximating the contents of standing trees and wood lots.

It is believed that such tables, applying directly to the white pine in Massachusetts, will be of great service to wood lot owners; for if the average owner knows the amount of wood in his lot, he will be led to take a greater interest in its care, and when the time for selling the timber arrives, he will be able to secure the real value of his product. At the present time the owners are often at a great disadvantage in arranging a sale, because they do not know the amount of timber standing on their lots.

In preparing the tables which follow, pains were taken to make them as accurate as the nature of tree growth will permit, and also as general in their application as possible. Where it was practicable to do so, the felled trees, after being measured, were followed through the mill, and the amount of lumber sawed out was ascertained. The data thus obtained furnished a means of reducing the work to a thoroughly practical basis, and of checking any possible errors of calculation.

The tables give the average volume of individual white pine trees of different diameters and heights. As various units prevail in different parts of the Commonwealth for measuring the contents of logs and trees, it has been necessary to make a table for each of the principal units employed.

In Bristol and Plymouth counties, for example, $\frac{5}{8}$ -inch boards are the standard unit among local lumbermen; and therefore one of the tables gives the volumes of standing trees in $\frac{5}{8}$ -inch boards. Throughout the northern section of the Commonwealth the contents of trees and wood lots are usually estimated in cords; and Table II. is based on this unit. The regular board foot, however, is the unit most widely employed, and it was used in constructing Table III. Since the measurements of the same trees were used in preparing the tables, with uniform height of stump and cutting limit in the top, the figures in the different tables can be readily compared and the relations of the different units of measurement established.

Tables IV. and V. are of more scientific than practical value. They give the volumes, in cubic feet, both outside and inside the bark, of the merchantable portion of the trees.

TABLE I.— *Volume Table, in Board Feet, for White Pine in Massachusetts.*

Volume in $\frac{5}{8}$ -inch boards, surface measure, and when cut into logs 50 inches long. Volume up to 4-inch top. Stumps taken at $\frac{1}{2}$ foot.

DIAMETER, BREAST HIGH (INCHES).	TOTAL HEIGHT (FEET).						
	30	40	50	60	70	80	90
	Bd. Ft.	Bd. Ft.	Bd. Ft.	Bd. Ft.	Bd. Ft.	Bd. Ft.	Bd. Ft.
5,	10	—	—	—	—	—	—
6,	15	20	30	—	—	—	—
7,	30	35	50	65	80	—	—
8,	35	50	70	85	110	—	—
9,	45	65	90	110	140	155	—
10,	—	85	110	140	170	195	—
11,	—	105	135	170	205	240	275
12,	—	125	165	205	245	290	300
13,	—	145	190	240	290	345	390
14,	—	—	225	280	340	400	450
15,	—	—	260	320	385	460	515
16,	—	—	295	360	440	525	590
17,	—	—	—	405	490	585	665
18,	—	—	—	445	545	655	745
19,	—	—	—	485	600	725	815
20,	—	—	—	525	650	795	895
21,	—	—	—	—	705	865	970
22,	—	—	—	—	760	930	1,050
23,	—	—	—	—	815	1,000	1,130
24,	—	—	—	—	870	1,070	1,205
25,	—	—	—	—	925	1,145	1,285

TABLE II. — *Volume Table, in Cords, for White Pine in Massachusetts.*Volume up to 4-inch top. Stumps taken at $\frac{1}{2}$ foot. Caliper rule.

DIAMETER, BREAST HIGH (INCHES).	TOTAL HEIGHT (FEET).						
	30	40	50	60	70	80	90
5,	Cords. .03	Cords. —	Cords. —	Cords. —	Cords. —	Cords. —	Cords. —
6, . . . . .	.03	.04	.05	—	—	—	—
7, . . . . .	.04	.05	.07	.09	—	—	—
8, . . . . .	.05	.07	.09	.11	.13	—	—
9, . . . . .	.07	.09	.11	.13	.16	—	—
10,	—	.11	.13	.16	.19	.22	—
11,	—	.13	.16	.19	.23	.26	.30
12,	—	.15	.19	.22	.27	.31	.35
13,	—	.17	.22	.26	.31	.36	.40
14,	—	—	.25	.30	.34	.41	.45
15,	—	—	.28	.34	.40	.46	.51
16,	—	—	.32	.38	.44	.52	.58
17,	—	—	—	.42	.49	.58	.64
18,	—	—	—	.47	.55	.64	.71
19,	—	—	—	.51	.60	.70	.79
20,	—	—	—	.55	.66	.77	.87
21,	—	—	—	—	.72	.85	.95
22,	—	—	—	—	.78	.92	1.04
23,	—	—	—	—	.84	1.01	1.13
24,	—	—	—	—	.90	1.08	1.22
25,	—	—	—	—	.97	1.16	1.32
26,	—	—	—	—	—	—	1.42
27,	—	—	—	—	—	—	1.51

TABLE III — *Volume Table, in Board Feet, for White Pine, in Massachusetts.*

Scaled by rule made from mill tallies. Volume up to 4-inch top.
Stumps taken at $\frac{1}{2}$ foot.

DIAMETER, BREAST HIGH (INCHES).	TOTAL HEIGHT (FEET).						
	30	40	50	60	70	80	90
	Bd. Ft.	Bd. Ft.	Bd. Ft.	Bd. Ft.	Bd. Ft.	Bd. Ft.	Bd. Ft.
5,	10	—	—	—	—	—	—
6,	15	20	30	—	—	—	—
7,	20	30	40	50	65	—	—
8,	25	35	50	65	85	—	—
9,	30	45	60	80	105	115	—
10,	—	55	75	95	125	145	—
11,	—	65	90	115	145	170	200
12,	—	75	105	135	165	200	230
13,	—	90	120	155	190	235	260
14,	—	—	135	175	215	265	300
15,	—	—	155	195	245	300	340
16,	—	—	175	215	270	335	380
17,	—	—	—	240	300	370	420
18,	—	—	—	260	325	405	465
19,	—	—	—	280	355	445	510
20,	—	—	—	305	385	485	555
21,	—	—	—	—	420	525	605
22,	—	—	—	—	450	570	650
23,	—	—	—	—	480	620	700
24,	—	—	—	—	515	665	750
25,	—	—	—	—	550	715	800
26,	—	—	—	—	—	—	855
27,	—	—	—	—	—	—	905

TABLE IV. — *Volume Table, in Cubic Feet, for White Pine in Massachusetts.*Volume outside bark up to 4-inch top. Stumps taken at $\frac{1}{2}$ foot.

DIAMETER, BREAST HIGH (INCHES).	TOTAL HEIGHT (FEET).						
	30	40	50	60	70	80	90
5,	Cu. Ft. 1.8	Cu. Ft. —	Cu. Ft. —	Cu. Ft. —	Cu. Ft. —	Cu. Ft. —	Cu. Ft. —
6,	2.6	3.3	4.3	—	—	—	—
7,	3.4	4.4	6.1	7.7	—	—	—
8,	4.5	6.0	7.8	9.8	12.0	—	—
9,	5.9	7.7	10.0	12.0	15.0	—	—
10,	—	9.6	12.0	15.0	17.9	20.9	—
11,	—	11.6	14.6	17.9	21.4	24.9	28.7
12,	—	13.9	17.6	21.1	25.3	29.8	33.7
13,	—	16.2	20.4	24.8	29.2	34.7	38.7
14,	—	—	23.7	28.7	32.5	39.6	43.6
15,	—	—	26.8	32.6	37.9	44.5	49.5
16,	—	—	30.5	36.5	42.3	49.8	55.9
17,	—	—	—	40.3	47.2	56.7	62.3
18,	—	—	—	44.6	52.6	61.5	69.1
19,	—	—	—	49.0	57.9	67.8	76.9
20,	—	—	—	52.9	63.2	74.7	84.8
21,	—	—	—	—	69.1	82.0	92.6
22,	—	—	—	—	74.9	89.3	101.4
23,	—	—	—	—	81.3	98.1	110.8
24,	—	—	—	—	87.1	104.9	119.0
25,	—	—	—	—	94.0	112.6	128.8
26,	—	—	—	—	—	—	138.6
27,	—	—	—	—	—	—	147.3

TABLE V.—*Volume Table, in Cubic Feet, for White Pine in Massachusetts.*Volume inside bark up to 4-inch top. Stumps taken at $\frac{1}{2}$ foot.

DIAMETER, BREAST HIGH (INCHES).	TOTAL HEIGHT (FEET).						
	30	40	50	60	70	80	90
5,	Cu. Ft. 1.5	Cu. Ft. —	Cu. Ft. —	Cu. Ft. —	Cu. Ft. —	Cu. Ft. —	Cu. Ft. —
6,	2.3	3.0	3.7	—	—	—	—
7,	3.3	4.1	5.2	6.3	8.0	—	—
8,	4.2	5.5	6.8	8.5	10.8	—	—
9,	5.1	7.0	8.7	10.7	13.5	15.0	—
10,	—	8.7	10.6	13.4	16.3	18.5	—
11,	—	10.4	12.9	16.0	19.3	22.5	25.5
12,	—	12.3	15.3	19.0	22.7	26.5	30.0
13,	—	14.0	18.0	22.0	26.5	31.0	34.5
14,	—	—	20.8	25.5	30.0	35.5	39.5
15,	—	—	24.0	28.7	34.0	40.5	44.5
16,	—	—	27.3	32.3	38.5	45.5	50.5
17,	—	—	—	36.0	43.0	51.0	56.5
18,	—	—	—	39.5	47.5	56.5	63.0
19,	—	—	—	43.2	52.5	62.0	69.5
20,	—	—	—	47.0	57.5	68.0	75.5
21,	—	—	—	—	62.5	74.5	82.5
22,	—	—	—	—	67.5	81.0	90.0
23,	—	—	—	—	73.0	88.0	97.0
24,	—	—	—	—	78.5	95.0	104.5
25,	—	—	—	—	84.0	102.0	112.0

Travel.

In order to keep the office in close touch with the men on duty in the woods or in lecture work, a system of card diaries has been employed. These show that the State Forester and his assistants travelled 10,293 miles on duty during the nine and a half months covered by this report. The record of travel is referred to as an indication of the activity of the service.

A Forest Map.

The collection of data for a forest map of the Commonwealth has been carried on in collaboration with the Bureau

of Statistics of Labor. Skeleton maps of sections of the Commonwealth's area were obtained, and the extent of woodlands has been sketched in on these, and at the same time notes have been made as to the age and character of the growth. When this work is completed the sections will be joined, to form a complete forest map of the Commonwealth. The work has not progressed far enough to warrant a definite report as to results. The indications are, however, that the map will furnish more satisfactory information about the extent and value of woodlands than we now possess.

Co-operation with the United States Forest Service.

The plan of co-operation between this office and the United States Forest Service, which was outlined in my first annual report, continued in force until September 10, when my request for a transfer from the detailed list to the furloughed list of the United States Service was granted. The request was made because I was about to leave the service of the Commonwealth (as noted on page 19).

It is important that this office should work in close touch with the United States Forest Service, for a failure to do so might easily lead to a great deal of duplication of work and unnecessary expense. I hope that co-operation may be continued by my successor.

Expenditures and Receipts.

As there was a deficiency last year, due to the failure of the General Court to appropriate the full amount specified in the law creating the office, a statement is given of the expenditures of 1905, as well as of 1906; \$4,544.05, including the deficiency, was appropriated for 1905, which amount is accounted for as follows:—

Salaries of assistants,	\$2,269 06
Travelling expenses (not included in co-operative funds),	496 23
Instruments,	674 48
Stationery and other office supplies,	707 77
Printing,	209 60
Postage,	129 30
Miscellaneous,	56 14
Balance unexpended,	1 47
	<hr/>
	\$4,544 05

The appropriation for the eleven months constituting the fiscal year of 1906 was \$4,583.33, which is accounted for as follows:—

Salaries of assistants,	\$2,035 20
Travelling expenses (not included in co-operative funds),	400 46
Instruments,	81 50
Stationery and supplies,	449 42
Printing,	420 58
Postage,	109 60
Miscellaneous,	84 85
Balance Sept. 15, 1906,	1,001 72
	<hr/>
	\$4,583 33

Receipts from the United States for services rendered under the co-operative agreement (referred to on page 13) amounted to \$208.33. Receipts for two farmer's institute lectures, under the auspices of the State Board of Agriculture, amounted to \$20. There was realized \$13.65 from sale of seedlings from the nursery (referred to on page 6). This makes a total of \$241.98 received during the year, which amount has been turned over to the Treasurer and Receiver-General.

Travelling and subsistence expenses incurred in examining wood lots (page 5) and in delivering lectures (page 2), which were borne by applicants:—

John A. Baldwin, Marion,	\$2 60
Franklin B. Dexter, Fairhaven,	5 80
East Medway Grange, Millis,	1 36
Executive department, travelling expenses of delegate to Washington and return,	37 45
Fitchburg Woman's Club, Fitchburg,	2 53
Francis B. Greene, New Bedford,	1 45
Hampshire County, Pomona Grange, Easthampton,	1 17
Dwight B. Heard, Cherry Brook,	9 22
W. R. Hannum, Easthampton,	30
C. D. Hosmer, Orange,	2 06
J. H. Hutchings, Phillipston,	24 21
C. A. Judd, South Hadley,	12
State Board of Agriculture, travelling expenses, lecture at Lancaster,	2 40
Laurence Minot, Wareham,	5 75
George P. Morse, West Wareham	2 45
New England Box Company, Greenfield,	9 50

Old Colony, Pomona Grange, Stoughton,	\$0 95
Board of Prison Commissioners, West Rutland,	8 96
F. A. Smith, Ipswich,	1 40
Lewis A. Wright, Gardner,	3 03
On deposit with the State Forester: —	
Dwight B. Heard, Cherry Brook,	15 78
W. O. Whitecomb, Egremont,	50 00

The Taxation of Woodlands.

As stated in last year's report, there is a great deal of dissatisfaction with the present method of assessing taxes on forest lands. This dissatisfaction is shown by the laws that the different States are enacting along these lines. Pennsylvania has a rebate system; if a private owner will fulfil certain conditions, he receives a portion of his taxes back after they have been paid. Connecticut, Massachusetts and other States also have special laws in regard to the taxation of certain classes of woodlands. For the most part these laws are not operative because they were not carefully thought out. They serve to show the feeling of discontent with the present system, but they do not furnish a satisfactory solution of the problem.

The system, now generally in vogue, of assessing forest lands for the purpose of taxation, provides for the taxation not only of the land but of the growing crop as well. A farmer's wheat crop is not taxed while it is growing. An orchard or a vineyard yields returns in a very few years, but the wood lot is oftentimes taxed for years before any returns come in. Suppose, for example, a piece of land is planted to white pine, which is to be cut fifty years from now. As soon as that pine has reached a size at which it adds any value to the land, the property is assessed accordingly until it is cut, when it is again put back to the value of the land without the crop. In other words, the present system provides for the taxation of raw material, not only once, but many times. When this raw material is universally used in our manufactures, such heavy taxation is of doubtful expediency, granting it to be fair, which it is not. It hinders the increase of wealth by taxing it at its source.

So there is dissatisfaction for two reasons: first, the crop

as well as the land is taxed, which is not the case with ordinary agricultural crops; and, second, the crop is taxed while it is not bringing in anything, and therefore the owner is not in a condition to pay taxes on it.

The committee appointed in 1905 to investigate the taxation of woodlands reported to the General Court of 1906. The report was printed as House Document, No. 134, which was referred to the General Court of 1907 for action. A further consideration of this report is recommended, as it is the result of the most thorough investigation of this question ever made in America.

The need of reform along this line is emphasized by the fact that most of the woodlands of the Commonwealth are in the hands of private owners, and the private owner's actions are influenced largely by self-interest. Although the State may acquire certain lands for State forests, still, the great body of woodlands will always remain in the hands of individuals. Now, it is to the communities' interest that private holdings should continue to produce, generation after generation, the greatest possible amount of useful material; and the individual owner should be given every reasonable chance to harmonize his interests with those of the community. A reform in our tax laws as applied to woodlands would be a step towards bringing private and public interest together.

State Forests.

The Commonwealth ought to extend its policy of park reservation to include genuine State forests. The reservations that have been made so far are distinctly for park purposes; there are, however, considerable areas in these reservations that could be used for timber growing. Portions of the Middlesex Fells and the Blue Hills reservations might be so utilized without any reduction in their value as parks; on the contrary, their park features would be enhanced. The same might be said of Mount Wachusett, Mount Tom and Greylock reservations, the Province Lands on the Cape, and the land surrounding the Clinton reservoir. The land about this reservoir is already being planted by the Metropolitan Water and Sewerage Board. The forest in the Mount Wa-

chusetts reservation is also being improved by the commission which has that reservation in charge. It is to be hoped that all of the boards and commissions having State lands under their charge will follow these good examples, and make the lands that the State owns as productive of forest supplies as is consistent with the purposes for which they were acquired.

But the lands mentioned are small in area, and the State might well follow the precedent established by several other States, and acquire lands for the purpose of growing timber on them. New York has a forest reserve of 1,436,000 acres, and Pennsylvania has acquired 572,000 acres for forest purposes. New Jersey, Connecticut and other States have also adopted reservation policies.

Lands for forest reservations can very often be acquired at a small cost. A few years ago Connecticut bought 900 acres, at an average cost of only \$1.64 per acre; in Massachusetts they could be had for \$5 and under. There are large areas of overgrown, stony, abandoned pastures, cut-over lands that have been burned repeatedly, scrub oak lands and the like, that are in such conditions that an individual owner cannot afford to improve them. The State can afford to bring these lands into productivity for the common weal. When once well stocked, the sale of mature timber should not only provide for the maintenance of such reservations, but should return a net revenue into the treasury of the State. Some of the European governments obtain as much as \$4 net per annum from each acre in the State forest.

In addition to their use for timber production, such reservations furnish recreation grounds for the people. This use for recreative purposes under reasonable restrictions is not inconsistent with the production of timber. The arguments which caused the Commonwealth to appropriate \$6,380,000 for the metropolitan parks and considerable sums for the other State park reservations apply in no part to the acquisition of State forests.

The educational effect of well-managed State forests is one of their chief advantages. They should, as far as is consistent with their economical management, be widely dis-

tributed over the State, in order that they may serve as object lessons in practical forestry.

Forest Fires.

Forest fires continue to be a menace to the woodlands of the Commonwealth. Investigations into the cause, prevalence, extinguishment and prevention of forest fires were begun as soon as this office was established. They were temporarily interrupted by the special investigation of taxation of forest lands, ordered by the General Court of 1905, but they were resumed this year and carried to a conclusion. The results of this investigation are embodied in Bulletin No. 5 of this office.

It is recommended that action be taken to improve the present forest fire service.

Appropriations Insufficient.

In view of the fact that the work has been hampered by the lack of funds to carry it on properly, it is recommended that section 6 of chapter 409 of the Acts of 1904, which is, "A sum not exceeding five thousand dollars may be expended annually by the state forester, with the approval of the governor and council, in carrying out the provisions of this act," be amended to read: "A sum not exceeding six thousand dollars may be expended annually by the state forester, with the approval of the governor and council, in carrying out the provisions of this act."

Summary of Recommendations.

1. That the laws relative to the assessment of woodlands for taxation be amended.
2. That a fund for the purchase and maintenance of State forests be created.
3. That steps be taken to improve the system of protection from forest fires.
4. That appropriations for the State Forester's office be increased from \$5,000 to \$6,000.

Resignation of the State Forester.

In April I was elected to the chair of Forest Engineering in the University of Georgia, of one branch of which (Franklin College) I am a graduate. My reasons for accepting the professorship were explained in a note to the Governor, as follows: "I do not leave the service of the Commonwealth because of dissatisfaction with my work; on the contrary, I have enjoyed my service here as only one can who loves to fight for a good cause. Nor does the place in Georgia carry a larger salary; but I believe that it offers a better opportunity to forward the cause for which we foresters are working, and I feel it my duty to go."

My resignation was accepted, to take effect on Sept. 15, 1906.

Respectfully submitted,

ALFRED AKERMAN,

State Forester, Aug. 12, 1904, to Sept. 15, 1906.

PART II. — REPORT OF THE STATE FORESTER FROM SEPT.
15, 1906, TO DEC. 31, 1906.

To the General Court.

Having been appointed State Forester, to succeed Mr. Alfred Akerman, I assumed supervision on September 15, and therefore the following report covers the time from that date until the end of the year.

The policy has been to carry forward the work already in hand, and get thoroughly in touch with the purpose of the office.

A letter was addressed and sent out quite generally, in order to acquaint the public with the change of administration. The letter follows: —

To All Interested in the Forestry Problems of Massachusetts.

Having been appointed to the position of State Forester, I take this opportunity to say that in assuming my official duties I sincerely wish your hearty co-operation in furthering all true and worthy interests relative to forestry problems within this Commonwealth.

In accepting the position, I do so with the assurance and belief that all organizations and individuals interested in forestry will lend an assisting hand to further promote and develop this great and much-neglected economic industry.

It is believed that the forest service work throughout the State can be made a great blessing, provided people who own lands acquaint themselves with the workings of the offices of the State Forester.

I have been engaged in agricultural economics and education in New England for the past eleven years, and forestry instruction at the New Hampshire College, together with its practical application generally, has received my earnest study and natural interest.

The forest crop needs much skill and science in handling, for best results. There are thousands of acres at present practically idle through mismanagement, that should and eventually must be made a great resource to the Commonwealth. Let us check this unnecessary loss, and foster modern methods in rural affairs. Education and example are our tools to work with.

In behalf of the position which I hold as State Forester, I therefore extend to you a cordial invitation to consult my office at any and all times on forestry matters, and let it be generally

known that the office is established by the State to accomplish great good for the whole State in general and each individual in so far as practicable.

(Signed)

Yours very sincerely,

F. W. RANE.

ROOM 7, STATE HOUSE.

Mr. Joseph J. Dearborn, a Harvard forestry student, was appointed assistant on October 1.

In accordance with section 6 of chapter 409 of the Acts of 1904, the expenditures from September 15 to December 1 were as follows:—

Salaries of assistants,	\$503 38
Travelling expenses,	161 29
Instruments,	72 20
Stationery (office supplies),	112 45
Printing,	106 00
Postage,	78 60
Miscellaneous,	54 94
	<hr/>
	\$1,088 86

In accordance with section 5 of the above-named act, the following receipts for travelling and subsistence were received:—

Geo. W. Beals, Norfolk,	\$2 79
E. A. Bowen, Lakeville,	2 50
Geo. M. Whipple, Newburyport,	2 02
W. F. Whitney, South Ashburnham,	5 70
Dr. H. W. Nelson, Marshfield Hills,	1 85
Dr. H. W. Nelson, Marshfield Hills,	3 15
L. E. Ware, Norfolk (paid by owner).	
C. S. Davison, South Williamstown,	8 82
J. T. Palfrey, Norfolk,	96
W. G. Nickerson (paid by owner).	
R. B. Corey, Scituate,	1 08
Mrs. E. H. Woods, Acton,	1 00
Oxford Agricultural Society and Grange, Dudley,	4 50
Farmers' and Mechanics' Club, Holden,	3 25
	<hr/>
Total,	\$37 62

On deposit with the State Forester:—

R. B. Corey, Scituate,	\$8 92
Dwight B. Heard,	13 62
	<hr/>
Total,	\$22 54

Besides the above, the office has been constantly made use of by people on all kinds of forestry problems, and the correspondence has been fairly large and interesting.

It is the purpose of the office to make its usefulness felt in the most effective way. Conferences have been asked for, and in most cases already held, with the leading organizations of the State, through which channels immediate results can be had. Such organizations are represented by the grange, State Board of Agriculture, Massachusetts Agricultural College, other colleges, Board of Education, Federation of Women's Clubs, press, Board of Trade, normal schools, etc. The Massachusetts Forestry Association has co-operated in every way possible.

Since accepting this position the forester has addressed the following organizations: the Society for the Promotion of Agricultural Science, the State Grange, the Boston Market Gardeners' Association, the Massachusetts Forestry Association, and has attended the annual meeting of the Massachusetts State Board of Agriculture and the American Association for the Advancement of Science.

Several trips were made during the fall into various sections of the State, in order to get better acquainted with forestry conditions.

After studying the forestry problems in so far as time would permit since accepting my present position, it would appear evident that there are several problems needing more careful attention, with a view to enacting some practical laws whereby better results can be obtained in systematizing modern forestry in the State. Those I would call attention to particularly are:—

1. Better forest fire protection.
2. Regulation of forest taxation.
3. A State forest reserve policy.
4. A more definite general educational system for enlightening our people and coming generations of the great economic importance of the forest crop.

Respectfully submitted,

F. WM. RANE,
State Forester.

FOURTH ANNUAL REPORT OF THE
STATE FORESTER OF MASSACHUSETTS
FOR THE YEAR 1907

FRANK WM. RANE

STATE FORESTER



APPROVED BY THE STATE BOARD OF PUBLICATION

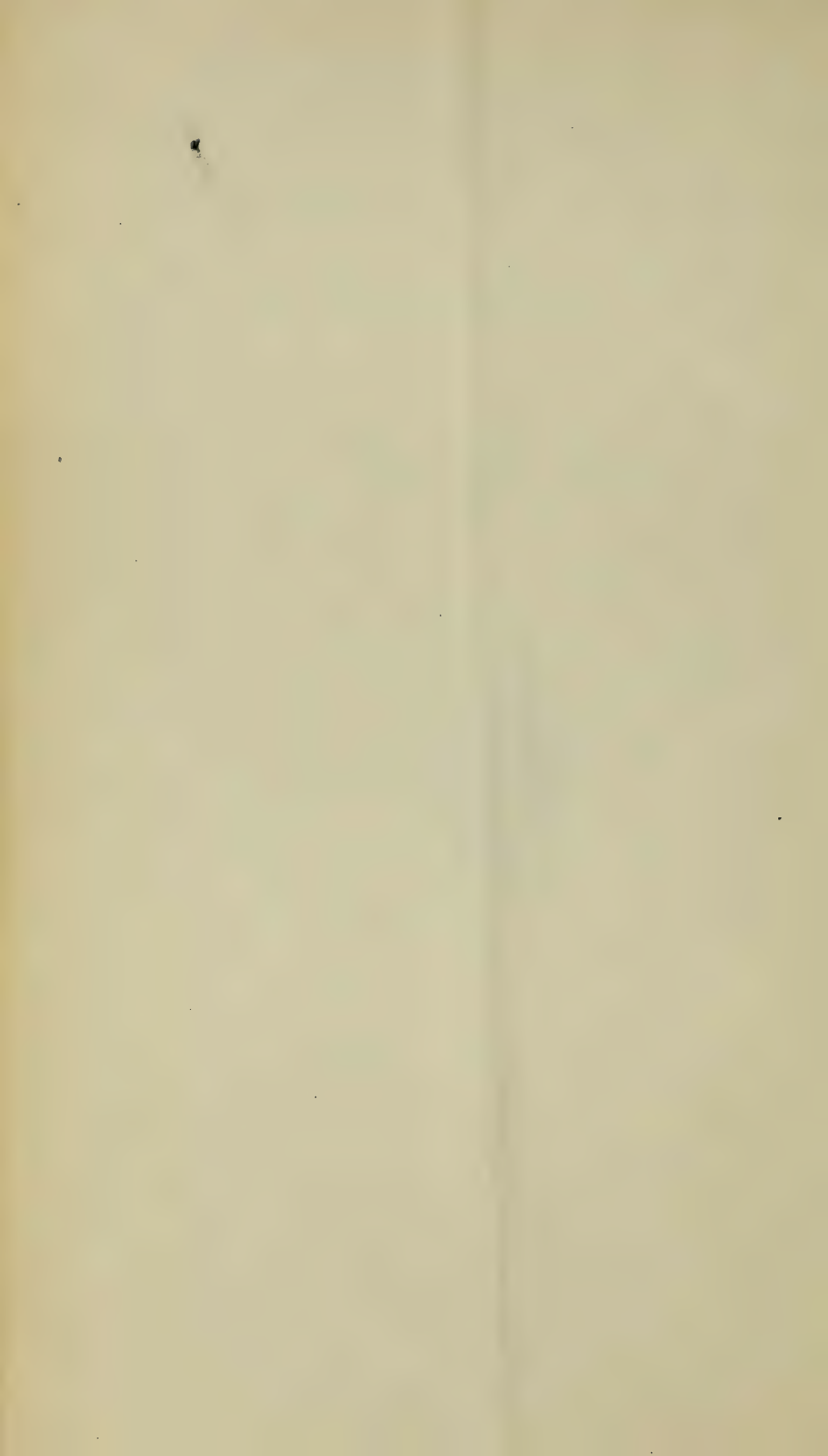
BOSTON

WRIGHT & POTTER PRINTING COMPANY, STATE PRINTERS

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Commonwealth of Massachusetts.

FOURTH ANNUAL REPORT OF THE STATE FORESTER.

To the General Court.

It is with a degree of pleasure that I offer this my first annual report, although the fourth since the establishment of the office of State Forester.

The efficiency of the office during the past year has been greatly increased in every direction. All of the lines of work previously begun by my predecessor have been carried forward, and many new features added. The work of making examinations and giving advice on forestry matters has been constantly growing, until at present the head of the department finds it almost impossible to meet the demands with his present force of assistants. The correspondence alone, we are told by the post-office authorities, has increased fully two hundred per cent during the year.

The hearty co-operation asked for upon my accepting the position of State Forester has been more than realized in the very hearty and cordial assistance rendered on every hand.

After a careful study of our forestry conditions, and definitely deciding upon what legislation was needed most, we were fortunate in being able to present some bills before the last General Court, even after the usual time had expired, due to the recommendations in Governor Guild's inaugural. These bills met with approval and were enacted.

At the forestry hearing before the committee on agriculture practically every organization in the State interested in forestry

was present. It would be impossible to have had a more representative hearing.

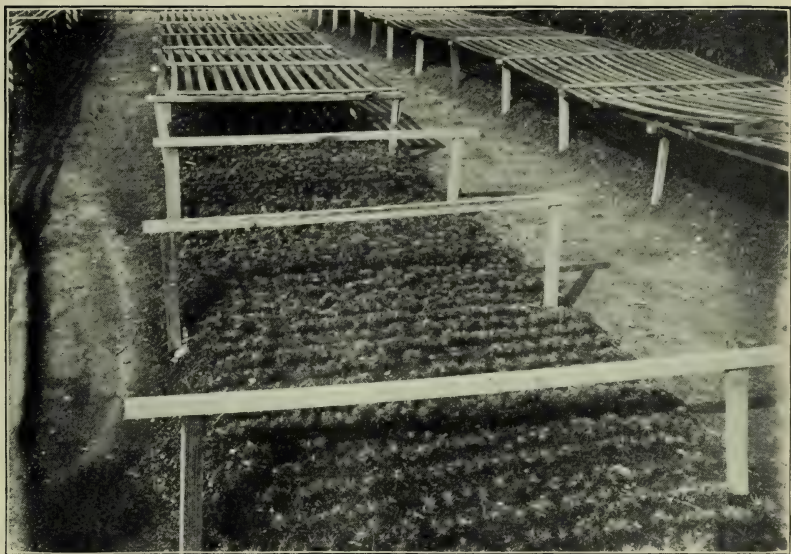
The following organizations passed definite resolutions favoring the bills which afterwards were enacted: the Massachusetts State Grange, at their annual meeting at Faneuil Hall, in Boston; the Massachusetts State Board of Agriculture, at their annual winter meeting; the Eastern Shook and Wooden Box Manufacturers Association, at their annual meeting at Young's Hotel, Boston. The executive committee of the Massachusetts Forestry Association assisted in many ways, and to Mr. Henry James, Jr., the chairman, I desire to give the credit of shaping these bills in their present excellent form. The presidents of the railroads traversing our State also gave their personal support toward better forest fire regulations and laws.

FOREST LAWS PUBLICATION.

Upon the passage of the new forest laws the State Forester compiled the various enactments of the State forest laws, and had the same printed in a small booklet, 10,000 copies of which have been distributed quite generally throughout the State. This booklet is of convenient size for carrying in one's pocket, and also can be sent in an ordinary letter envelope, and hence is admirably adapted for dissemination and use. The double index system of reference is carried out in the publication, the paragraphs being indicated by heavier type side headings.

FOREST FIRE POSTERS.

Following the instructions in the statutes, the State Forester had the abbreviated instruction of the forest fire laws printed on a large poster, 18 by 27 inches in size, and distributed generally throughout the Commonwealth. Paper posters were printed for use indoors, while similar cloth posters were distributed for out-of-door use. The main heading, "Forest Fire Laws," was printed in large letters of bright red, while the remainder was printed in green ink. In compliance with the law, the railroads have placed a poster in each of their depots, and similar notices are to be found in the various post-offices of the State. The others have been posted by the town authorities.



THE STATE NURSERY AT AMHERST.
White pine seedlings at the end of the first season.

THE FOREST WARDEN LAW.

Beginning with the coming spring elections in the towns, in accordance with the legislation of 1907, the new board of selectmen is empowered to appoint a forest warden, who shall be given authority to look after the forest interests of the town.

The particular channel of usefulness whereby the recent enactments of the Legislature have made it possible for the State Forester to accomplish results is through this town forest warden system.

The appointment of the town forest warden is subject to the approval of the State Forester. His compensation is met by the individual towns, and he has the power of appointing his deputies.

The forest warden may also be called upon by the State Forester for whatever information is desired from time to time: as the correcting of his town forest acreage; amount of reforestation done during the year; number and kinds of forest fires; depredations from insect and fungous disease outbreaks, etc. For this work the warden is compensated by the State Treasurer through bills presented to and approved by the State Forester. For this work he is paid at the rate of not to exceed 35 cents an hour.

The State Forester has the privilege of calling and making arrangements for conventions of forest wardens, and paying wholly or in part their travelling expenses, the only provision being that no money shall be expended in paying the travelling expenses of any one warden to or from more than one convention in any one year; that the total expense of said convention shall not exceed \$2,000, and be held within the Commonwealth. This enactment ought to furnish to a certain extent the brief schooling each year in practical forestry to the men who most need it for accomplishing economic results in the State. The law also, it will be seen, allows the State Forester the privilege of retaining valuable wardens in the various towns when they have proven their merit.

Through this law we now have a thoroughly systematized plan of usefulness, a natural channel through which it is believed much good to our forest interests must result. When we once

get a thoroughly organized corps of competent forest wardens, one in each of our three hundred and twenty towns, who can intelligently handle forest fires and other forestry matters of vital concern, we shall have made great progress, both from the economic and æsthetic standpoints. The small booklet, "Brief Instructions to Massachusetts Forest Wardens," discusses quite fully the duties of the forest warden. This is obtainable at the State Forester's office.

SPARK ARRESTERS ON RAILROAD ENGINES.

In compliance with the law passed at the last session of the Legislature, the Railroad Commission had a conference with the various railroads of the State, and after going over the matter of establishing what was thought to be an efficient spark arrester for every engine on each road operating in the State, the commission sent out the following orders to the railroad authorities. (The following being an example of that sent to one road):—

*Petition of the New York Central and Hudson River Railroad Company,
Lessee of the Boston & Albany Railroad, for Approval of Installation
and Maintenance of a Spark Arrester.*

After consideration, it is —

Ordered, That the approval of the Board, under the provisions of chapter 431 of the Acts of 1907, be hereby given to the installation and maintenance on engines of the Boston & Albany railroad of spark arresters of the type submitted with the petition, and shown upon plan filed therewith, entitled "New York central lines; smoke box; interior arrangement; locomotive," and dated Oct. 16, 1906.

Attest:

(Signed) CHARLES E. MANN,
Clerk.

The only thing yet to be established is that some definite methods of efficient inspection be arranged, and it is believed this is a matter that the railroads will regulate satisfactorily.

PUBLIC LECTURES AND ADDRESSES.

The calls for lectures on forestry by the State Forester have been many. It has been made a policy to accept invitations to address public meetings whenever it can be shown that good results are likely to follow. In accepting invitations, the request is made that an audience of at least one hundred be guaranteed,

if possible. This request has invariably resulted in more activity on the part of the local organizations in getting out large numbers, and in more efficient and far-reaching service on the part of the State Forester. An example of this might be cited. In asking for an address on forestry by an organization whose membership was thirty-six, the acceptance was on the condition that the meeting be made public, and under the usual requirements, resulting in an audience of over five hundred. The number of lectures delivered during the year was forty-five.

LECTURES AT THE AGRICULTURAL COLLEGE.

In accordance with arrangements made with the authorities representing the trustees of the college, a course of instructions on forestry, consisting of ten lectures and exercises, was given by the State Forester to the students of the college last spring. I am frank to say that it would be impossible to work with a more satisfactory and intelligent body of students than attended this course of lectures.

A talk on forestry was also given by the State Forester before the Conference on Rural Progress, called by President Kenyon L. Butterfield in October at the Agricultural College.

THE NATIONAL IRRIGATION AND FORESTRY CONGRESS.

The State Forester was invited to address the above congress at Sacramento, Cal., September 2 to 7, on "State Forestry Development," and present a paper upon "The Use of Artificial Fertilizers in Forestry." This trip was also made use of in visiting some large commercial nurseries in the middle west, as well as studying general forestry methods on the Pacific coast. The congress proved a great success, and was teeming with enthusiasm and interest, peculiar to western hustle. Similar meetings in the east would be productive of great good. Massachusetts was the only New England State that was represented by a delegate, and even New York and Pennsylvania were not represented. There are many features about our New England environment and conditions that are of great advantage in forestry. One thing particularly, — we do not have the dry season to overcome; and in reforestation this one thing is greatly in our favor, to say nothing about better markets, etc. An easterner

does well to study the comparative conditions of the east and west. If we were to keep much of our capital at home, and employ it equally as lavishly toward modern forestry or even agriculture, I believe as good or even better results could be assured.

OTHER LECTURES OUTSIDE THE STATE.

The State Forester has been called upon to address various other organizations of a national or State nature outside this State, and was able to give addresses on forestry before the following: the Society for the Promotion of Agricultural Science, held at Lansing, Mich., May 29; the National Horticultural Congress, held at Jamestown Exposition, September 23; and the New Hampshire State Board of Agriculture's annual winter meeting, at Whitfield, December 5. The meeting of the American Association for the Advancement of Science, which convened in New York the first of the year, was also attended.

PUBLICATIONS.

The publications of the office for the year are as follows: —

	Pages.	Copies.
"The Commonwealth of Massachusetts Forest Laws," . . .	50	10,000
"Brief Instructions to Massachusetts Forest Wardens," . . .	12	5,000
"How and when to collect White Pine Seed,"	16	10,000
"Forestry from the Commercial Standpoint,"	16	5,000
"The Commercial Forest Trees in Massachusetts, how you may know them" (in press).	68	5,000
"Forestry in the Primary Schools" (in press),	50	5,000
"Forest Laws concerning Railroads,"	8	5,000
Total,	220	45,000

THE FOREST NURSERY AT AMHERST.

Last spring the nursery work was reorganized and placed in the hands of R. S. Langdell of Lowell, a former student of the writer, who has greatly improved the nursery, although it has been carried on under very limited conditions. Instead of having the land allotted by the college in different places, as heretofore, it has been concentrated, and therefore more easily handled. A small, inexpensive tool and packing shed has been erected,



THE STATE NURSERY AT AMHERST.

Beds of white ash, ready for distribution.

where necessary implements for nursery work are housed and seedlings packed for shipment.

(a) *General Forest Seedlings distributed.*

In order to awaken interest and distribute seedlings throughout the State, notices were sent to all newspapers of the State, asking them to print the following offer from the State Forester:—

Seedling Forest Trees Available.—F. W. Rane, State Forester, State House, Boston, gives notice that he can distribute, to a limited number of those who apply, 150 white pine and 150 white ash, two-year-old trees, suitable for setting out for forest purposes. Send \$1 with order. Express charges will be advanced. No orders received after April 30. One order only per person, as the object is to disseminate them quite generally. Should the supply become exhausted, the money will be returned.

Set the plants where they are to grow, 6 by 6 feet apart, as soon as they are received. Do not allow the roots to get dry.

It is hoped that this one-fourth-acre planting will create an interest in doing more planting later. It is understood that these seedlings are to be planted in Massachusetts.

In response to this offer, one hundred and twenty and one-half orders were sent out, as indicated in the following table:—

NAME.	Address.	NAME.	Address.
Azro A. Coburn, .	Holyoke.	Lewis Damon, .	Ashby.
Arthur M. Robinson, .	Pittsfield.	James L. Miller, .	West Lynn.
W. W. Willard, .	Springfield.	W. L. Harris, .	Deerfield.
James H. Newton, .	Holyoke.	Horace T. Fogg, .	Norwell.
Robert M. Woods, .	—	John W. Waters, .	Fitchburg.
Mrs. Wm. L. Paddock,	Dalton.	Arthur P. Rugg, .	Sterling.
J. S. Hubbard, .	Fiskdale.	P. W. McCellan,*	Haverhill.
W. L. White, .	Phillipston.	Eben S. Fuller, .	Clinton.
Pontoosuc Woollen		J. W. Van Huyck, .	Lee.
Manufacturing Com-		A. J. Wellington, .	Ashburnham.
pany, .	Pittsfield.	E. F. Powers, .	Leominster.
James Griffin, .	South Hadley.	Lester R. Maynard,	South Berlin.
Charles W. Power, .	Pittsfield.	L. B. Ramsdell, .	Gardner.
Geo. H. Goodbeer, .	Fitchburg.	W. A. Munson, .	Huntington.
Wm. B. Kimball, .	Enfield.	Claude J. Mathieu, .	West Boylston
John H. Holder, .	Hudson.	Joseph Smith, .	Unionville.
H. G. Zilliacus, .	Fitchburg.	David H. Tillson, .	Amherst.
Roy L. Eaton, .	Salisbury.	Edward F. White,*	Holyoke.
Silas W. Hutchinson, .	Fitchburg.	Charles L. Johnson, .	Southborough.
Waldo C. York, .	Marstons Mills.	R. L. Bowman, .	Middleborough.
Thomas C. Esty, .	Amherst.	J. M. Perkins, .	Hudson.
C. H. Waymouth, .	Fitchburg.	Henry F. Whitney, .	Lowell.
Albert F. White, .	East Freetown.	Myron A. Richardson,	West Brookfield.
Miss Helen Holmes, .	Kingston.	Edwin Warren, .	Spencer.
Willis F. Austin, .	Amesbury.	Thaxter Scott & Son, .	Hawley.
W. F. Whitney, .	South Ashburn-	Geo. E. Cogswell, .	Cushman.
	ham.	J. F. Rice, .	Barre.
Warren F. Bemis, .	Hubbardston.	Walter F. Partridge, .	West Upton.
Priest Bros., .	Littleton.	J. Henry Gleason, .	Marlborough.

* Two orders.

NAME.	ADDRESS.	NAME.	ADDRESS.
Chas. M. Phelps, .	Blandford.	Walter White, . .	Templeton.
Marcus M. Multer, .	Marlborough.	C. R. Stewart, . .	Templeton.
Thos. H. Skinner, .	Princeton.	Wm. B. Hale, . .	Templeton.
E. H. Alderman, .	Chester.	Seth P. N. Hall, .	Williamsville.
Mrs. Adolph Miller, .	West Springfield.	A. B. Terry, . .	Williamsville.
Mrs. Mary A. Butterick,	Sterling.	A. S. Lodge, . .	Williamsville.
G. L. Twitchell, .	Brookfield.	L. E. Parminter, .	Williamsville.
C. L. Fairbanks, .	Southborough.	L. W. Buffington, .	Williamsville.
E. W. Howe, .	Concord.	L. W. Morgan, . .	Williamsville.
Chas. F. Allen, .	Rowley.	B. F. Collins, . .	Williamsville.
Frank Sprague, .	Still River.	L. M. Thomas, . .	Templeton.
P. C. Bronson, .	Ashfield.	Benjamin D. Hyde, .	North Amherst.
F. H. Holden, .	Plainfield.	W. A. Graves, . .	Greenfield.
D. S. Freeman, .	Millington.	R. R. Ranney, . .	Ashfield.
John H. Daniels, .	Fitchburg.	W. H. Carter, . .	Andover.
C. H. Ball, .	East Windsor.	Miss Sarah Fuller, .	Newton Lower
R. F. Walsh, .	Easthampton.		Falls.
Wm. Haskett, .	South Athol.	Ella C. Jordan, . .	Newton Lower
F. W. Whitney, .	South Athol.		Falls.
O. E. Bradway, .	Monson.	Geo. B. Haskell, . .	Rochester.
Julia F. Darling, .	Milford.	Charles A. Stone,* .	Plymouth.
Wm. Hale, .	Newburyport.	Fred A. Hannaford, .	South Lancaster.
H. J. Franklin, .	Wareham.	L. Cora Brown, . .	Concord.
Henry M. Allen, .	Chilmark.	Thomas R. B. Dole, .	Ayer.
Lot Phillips & Co.,*	West Hanover.	A. M. Bridgman, . .	State House,
J. W. Howes, .	South Fall.		Boston.
E. C. Wright, .	Campello.	Arthur H. Wellman, .	Topsfield.
C. E. Norton, .	Cambridge.	A. P. White, . .	Salem.
J. A. Monahan, .	Fiskdale.	C. H. Copeland, . .	Scituate.
C. H. Johnson, .	Easthampton.	Geo. W. Burroughs, .	Acton.
Edwin A. Start, .	Billerica.	L. L. Lewis, . .	Ashland.
F. H. Foster, .	Andover.	F. W. Peters, . .	Bolton.
H. Gertrude Hale, .	Templeton.		

* Two orders.

(b) *Distribution of Forest Tree Seeds and Seedlings to Schools.*

Thinking our public schools might be interested in having some seeds and seedlings for educational purposes, the following letter was addressed to each superintendent in the State:—

To School Superintendents.

In connection with the State forest service we have a forest nursery, and it has occurred to me that there are schools that would derive a great deal of knowledge and economic benefit from having a small collection of forest tree seedlings growing in the school grounds or in the school gardens where they are already established.

Forestry is a subject worthy of promotion, and the simple A B C of forestry can well be begun with our school children. Trees have much of interest in them at any time of the year, and hence can be studied at any season. There is wide interest at present in school gardening; if to it we add some forest nursery work, making it a year-round affair and a perennial rather than for a short season each year, I am sure it will be a happy improvement.

Make it a plan to have the children collect tree seeds when they are ripe; then plant and care for the seedlings, ultimately transplanting them upon our many thousand acres of waste land in all sections of our Commonwealth. Some seeds, like the acorn and chestnut, may be planted directly where they are to grow.

In order to assist any schools in a beginning, I am going to offer to a limited extent, in so far as our seedlings hold out, and we can spare the time to do the work, — first come, first served, — a collection of seedlings and seed as follows: —

12 white pine seedlings, two years old.
24 white ash seedlings, two years old.
12 red spruce seedlings, two years old.
5 beech seedlings.

$\frac{1}{2}$ ounce of white pine seed (900 seed).
12 chestnut seed.
25 acorn seed.
50 white ash seed.

Bulletin No. 4 of this office, giving instructions for handling and care of the nursery, will be sent with each order.

The only expense to the school requesting this list will be the estimated actual expense in digging, packing, etc., \$1 for each collection. The express charges will be advanced. Only one collection is offered a school. The \$1 should accompany the order. Should we be unable to send the collection, the money will be returned. No orders should be sent in to reach the office later than May 1.

It is hoped that in this small beginning we may foster in the young, our coming generation, not only a fundamental economic recognition of forestry, but return to Massachusetts and New England the natural beauty we all so much would love to see.

Yours very sincerely,

F. W. RANE,
State House, Boston, Mass.

In response to this offer forty-seven orders were received, and sent out as indicated in the following table: —

NAME.	ADDRESS.	NAME.	ADDRESS.
C. H. Morse, .	Medford.	Frank A. Andrews, .	Greendale school, Worcester.
Mary L. Lincoln, .	Lancaster.	Mary L. Potter, .	Lawrence.
H. E. Richardson, .	Greenfield.	Florence Marshall, .	Tolland.
Amelia R. Amos, .	North Attleborough.	John I. Rackcliffe, .	Campello.
A. L. Hardy, .	Amherst (2 orders).	Edward Warren, .	Spencer.
J. W. Waters, .	Fitchburg.	Benj. D. May, .	Nantucket.
Prof. C. M. Weed, .	Lowell.	Jessie P. Leary, .	Salem.
John G. Thompson, .	Fitchburg.	Jennie C. Foskett, .	Charlton.
W. S. Bagg, .	Springfield.	Wm. H. Martin, .	Comins school, Roxbury Crossing, Boston.
S. D. Brooks, .	Brighton.	Lincoln Owen, .	Rice school, Boston.
C. S. Lyman, .	Hudson.	M. S. Donaldson, .	Brockton.
Monatiquot school, .	Braintree.	M. L. Brown, .	Rhode Island Normal School, Providence, R. I.
Penniman school, .	Braintree.	F. A. Morse, .	R. G. Shaw school, Boston.
Noah Torrey school, .	South Braintree.	Helen F. Batchelder, .	Bridgewater.
W. L. Coggins, .	Rockland (8 orders).	E. H. Russell, .	State Normal School, Worcester.
W. E. Gushee, .	Ludlow (3 orders).	Nellie L. Bailey, .	School Street school, Haverhill.
E. F. P. Perrin, .	Grammar school, West Barnstable.		
L. M. Moody, .	High school, Hyannis.		
S. W. Ferguson, .	Osterville.		
Miss R. O. Kendall, .	Pittsfield.		
Miss Adah L. Harvey, .	Northfield grammar school.		

Fifteen thousand two-year-old white pine seedlings were purchased from the New York State Forester and several thousand

from other sources, which were used in filling the above orders.

Each person for whom a forest working plan or assistance in forestry has been given, in so far as there were records in the office, was consulted, that he might be assisted in procuring seedlings at reasonable rates. The office charged in each instance simply enough to cover the expense of first cost to the State. Where many small lots, as to schools and farmers, were sent, the expense of packing for shipment has been proportionally higher than were we shipping in larger quantities.

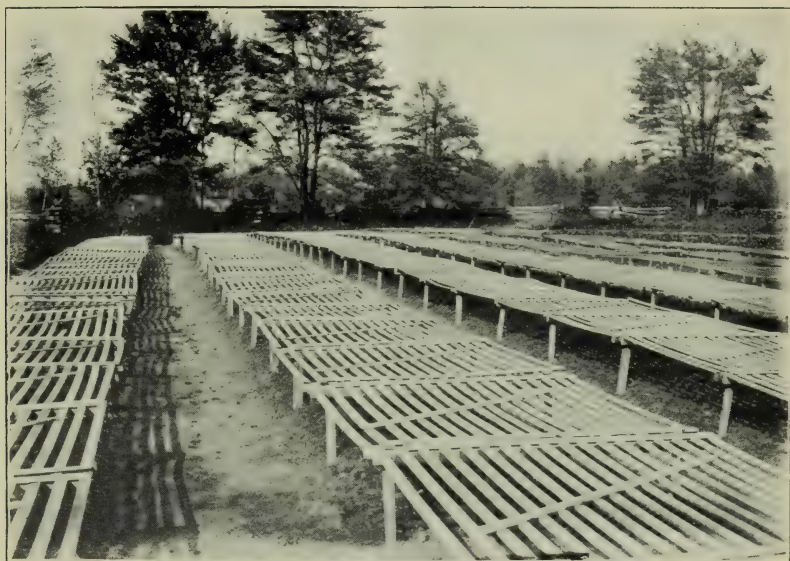
(c) *Other Seedlings distributed.*

Besides the above, the following seedlings were also distributed from the nursery: —

C. F. King, Taunton, 5,000 white ash,	\$15 00
Mr. Paine, State House, 250 beech, 500 white ash,	2 25
Mr. Paine, State House, 1 pound white pine seed,	4 00
F. A. Smith, Taunton, 1,000 white ash,	3 00
Theodore F. Borst, South Framingham, 6,000 white ash,	18 00
W. G. Nickerson, Dedham, 3,000 white ash,	9 00
Alfred S. Hayes, Ashland, 4,000 white ash,	12 00
Lyman E. Ware, Norfolk, 1,000 white ash and 50 white pine,	3 25
Edward Sturgis, Andover, 500 white pine,	1 50
C. N. Field, Foxborough, 100 white ash,	35
Total,	\$68 35

Nursery Stock on Hand, Fall, 1907.

White ash transplants,	40,000
White pine, one year old,	200,000
White pine, two years old,	15,000
Norway spruce, one year old,	25,000
Norway spruce, two years old,	2,000
Catalpa, one year old,	3,500
Chestnut, one year old,	90
Sycamore,	200
Maple, red,	2,000
Maple, rock,	100
White pine, two years old, purchased from nurserymen,	250,000
Total,	538,790



PORTION OF THE STATE NURSERY AT AMHERST.

Showing the screen protection given evergreen seedlings.

Seed collected, 1907.

White pine,	65 pounds.
Chestnut,	1 bushel.
Box elder,	1 bushel.
Locust,	small amount.
Horse chestnut,	" "
Norway spruce,	" "
Pitch pine,	" "
Austrian pine,	" "
Tulip tree,	" "
Maple,	" "

Fifty pounds of white pine seed have also been purchased for spring distribution.

The trustees of the Agricultural College have voted additional land for next spring's use in enlarging the present area. It is believed we can well afford to do even more in growing and distributing various tree seedlings at cost. When the time comes that commercial growers are prepared to furnish them at lower rates, the States' policy will undoubtedly be to do less.

FORESTRY EXHIBITS.

Two forestry exhibits have been made by the State Forester during the year, one at the Sportsmans' Show, held at the Mechanics building in Boston last spring, and the other at the annual winter meeting of the State Board of Agriculture, held at Horticultural Hall, Boston, December 3, 4 and 5. The exhibit consisted in showing different kinds of forest seeds and seedlings of various ages. The seedlings and transplants were displayed in the ordinary seed-bed conditions, and also suspended in glass jars, so the whole root system could be shown. Photographs, forest maps, wood sections, forest implements, charts, forest fire posters and a full set of the publications of the office were also shown. A number of names of persons interested were secured, and much assistance given by way of explanation of the material at hand. After making the last exhibition the material was moved into a room adjoining this office in the State House, where it is being used for demonstration purposes.

CO-OPERATION WITH THE UNITED STATES FOREST SERVICE.

The State Forester wishes here to acknowledge the hearty co-operation that Mr. Gifford Pinchot and his able assistants have rendered whenever called upon. When requests have gone in to the United States Forest Service for assistance on examinations, lectures, etc., from Massachusetts, they have been referred to this office by the Forest Service, and we have gladly co-operated in the work.

* · EXAMINATION OF WOODLANDS AND PRACTICAL ASSISTANCE GIVEN OWNERS.

This work has been one of the strong features of the office from the first, and nothing has been left unturned to make the work effective and helpful to as many applicants as we were able to assist during the year.

All the work heretofore done by my predecessor in office was carefully gone over, and in as many cases as possible the actual field examined. In every case of which there is a record in the office, the owner was either seen personally or addressed, in order to know just how effective the assistance has been. Not only was this system carried out with the examinations and assistance of this office, but the United States Forest Service heartily co-operated in sending a complete set of the working plans and names of persons from Massachusetts who had been assisted not only before this office was established but up to the present. This, therefore, gives us the data at hand of practically all of the examinations and assistance given in the State.

After completing the above list, each person receiving assistance was requested to furnish an up-to-date report of just what he had actually accomplished. The information thus received has been very valuable in guiding the work this year. Unfortunately, there were many instances where the assistance has resulted in nothing but an expense to the State, in that there seems to be little likelihood of its ever being made use of. This is particularly true of some of the most elaborate and expensive work this office has done. After trying to renew an interest in carrying out the original plan of these earlier applicants, the attention of the office was turned to the assistance of new applicants.

There were found to be 86 citizens on record as having had

woodland examinations. Of this number, 41 replies were received, 23 of which were carrying out the suggestions offered, and 8 wished further assistance. Upon studying the problem, it was found that to make the work effective something more than just a working plan and the giving of written advice are necessary to accomplish the success desired.

Mr. J. J. Dearborn of the Harvard Forestry School, and a young man of much practical forestry experience, was put in charge of this work. We followed out the policy of first meeting the owner upon his property, and of going over the proposed woodland proposition and getting as near as possible his needs and purposes. We then interested him in so far as practicable to determine what should and could be done, provided further plans and assistance were given. We have made 37 new examinations during the past year. Of this number, 33 are following out or contemplating the advice given. By contemplating is meant that they have already placed orders for seedlings, or shown definite indications of doing something either this winter or next spring.

Markings for thinnings have been made over different tracts, amounting in area to some 50 to 100 acres. In almost every case where a thinning was advised, enough was actually done to convey, as an example, the right idea to the owner.

The actual superintendence of the thinning out of one tract has been performed by the office, in order to demonstrate its practicability and secure definite data which is to be used in illustrating methods and results.

The largest tract that the office has undertaken is one of 1,600 acres, in the Berkshires. The field work and data have been secured for this tract, but the making of the map and report of office work end is still in progress. As a result of our assistance, the owner of this tract has employed as a permanent forester a graduate of the Harvard Forestry School of last year. The other tracts examined have been much smaller in area, although a number are of fair proportions, as Massachusetts woodlands run.

We have now several new applications on hand for examinations, one application for a working plan, and some requests for markings for thinnings.

In order to keep in touch with the cost of operations and

stumpage values, circular letters and schedules to be filled out have been sent to the lumbermen and dealers in different sections of the State.

TECHNOLOGICAL WORK.

During the past summer measurements were made by this office looking towards the construction of a yield table for white pine. A yield table is one which shows the amount of wood per acre that one can expect to obtain from pure even-aged stands of pine at different ages and for different localities. It is especially valuable to predict the yield of planted stands, since such stands are most likely to fulfill the conditions of the table. To make such a table it is necessary to select a large number of sample plots, one-quarter or one-eighth acre in size, taking care that the plots represent a great variety of ages, and as broad a range of locality and growing conditions as one can expect to find in a State of the size of Massachusetts. All the trees on the sample plots are measured for diameter and height, and the amount of lumber in each obtained from volume tables.

This work was in charge of Mr. H. O. Cook of this office, who had the assistance of Messrs. W. G. Howard and R. F. Weston of the Harvard Forest School, and Mr. R. C. Hall of the Yale Forest School. During two months, July and August, they measured one hundred and seventy-eight plots, in fifty-two towns. The accompanying map shows the towns and gives a clue to the number of plots measured in each. Other towns were visited, but as no plots were measured in them, no record of them was kept.

The travelling was largely done on foot; wood-using factories were visited, fire wards interviewed, and in various ways a great deal of general but valuable information on the forest growth, lumber prices, and on other subjects of interest to foresters was picked up and made note of.

The accompanying map is not alone useful in connection with the yield table work, but it gives some clue to the pine distribution in the State. The sections visited were naturally the leading pine-growing regions, and within these regions the amounts in the different towns are roughly proportional to the number of sample plots measured in those towns. The region of greatest production is in the northern part of Worcester County, together

with adjoining portions of Franklin and Middlesex counties. Petersham, where twenty-three sample plots were measured, is the banner town of this region and of the State.

The growth of individual pine trees, as well as the growth of acre stands has been studied by making what are known to foresters as stem analyses on more than two hundred and fifty trees. Where cutting is going on, trees are selected and the separate logs are measured for length, diameter and the growth for ten-year periods, as shown by the annual rings. The growth of the various logs together with the stump and the top when put together make up the growth of the entire tree. The individual trees are then assigned to certain types of growth, and tables constructed which will show the rate of growth of pine under varying conditions, and its rate of growth at different ages.

The yield tables, the growth tables and other information concerning the white pine as it grows in this State will soon be published in bulletin form.

Yield per Acre from thinning Pure, fully stocked White Pine.

AGE (YEARS).	TREES FIVE INCHES OR MORE IN DIAMETER.				ALL TREES.			
	Board Feet.	Stump- age at \$6 per M.	Value at \$16 per M.	Cubic Feet.	Cords.	Value at \$5 per Cord.	Stump- age at \$4 per Cord.	Cubic Feet.
25, .	1,400	\$8 40	\$22 40	280	11.0	\$55 00	\$44 00	880
30, .	3,700	22 20	59 20	720	12.0	60 00	48 00	1,040
35, .	4,950	29 70	79 20	850	12.3	61 50	49 20	1,090
40, .	6,000	36 00	96 00	1,030	12.8	64 00	51 20	1,150
45, .	6,800	40 80	108 80	1,140	13.0	65 00	52 00	1,190
50, .	7,400	44 40	118 40	1,240	13.4	67 00	53 60	1,240
55, .	7,900	49 40	126 40	1,310	14.0	70 00	56 00	1,310

The above table shows the yield to be obtained by thinning white pine stands of different ages in cases where the stand is pure, containing no other trees but white pine, and fully stocked, — that is, without pronounced holes or blanks.

The table is divided into two parts, one for trees five inches or more in breast-high diameter, the volumes of which are indicated in broad measure. The corresponding money values are given,—in the second column the stumpage value at \$6 per thousand, and

in the third column the value of the lumber at \$16 per thousand. The stumpage value is purposely put low, because in general the material taken out in thinnings is not of the highest quality, and is more expensive to get out than if the stand is cut clean.

In the second part trees of all sizes are included, and their volume is given in cords. Stumpage is reckoned at the rate of \$4 a cord. The value (\$5) used in the second column is the price usually obtained by owners who cut and haul their own wood to the mill in small lots. If \$1 is allowed for the labor of chopping and \$1 for the hauling, it will be seen that by this method the farmer gets a stumpage rate of only \$3, which is less than the common rate. This method of operating, however, has certain advantages in making thinnings: first, because any quantity of material, no matter how small, can be cut and sold; second, the cutting, when done by the owner, is sure to be done carefully, and this is important in making thinnings; third, if the work is done during the winter, when the farmer and his team have little to do, the entire \$5 can be regarded as clear profit.

FOREST MAP.

Two years ago the State Forester started the construction of a forest map of the State, through the agency of the census department. Agents of this department were provided with maps of all the towns in the State, visited the assessors of each town, and from their collective knowledge had them sketch on the maps the forest area, with notes on the kind of growth thereon. This method is at best rather a crude form of map making, and the data inaccurate, even though many of the maps have been corrected by members of this office. Until a more costly and better map can be made, however, it provides our best means for getting at the forest growth of the State and its area. The forest area so taken has been measured by this office, and the results of these measurements are given in the adjoined list.

The growth is divided into three main types: the pine type, — woodland containing over seventy-five per cent white pine; woodland consisting wholly of hard woods; and a mixed type of hard woods, in which are scattering pines and perhaps other conifers, as spruce and hemlock. In the last column are placed some

miscellaneous growths, not of great importance in the aggregate, but prominent in the towns in which they are situated.

Scrub means land covered with acorn brush, or a land covered with young growth of no commercial value.

Pitch pine, in Barnstable, Dukes and Nantucket counties, is put in the pine type.

The cedar referred to is the white cedar (*Chamæcyparis thyoides*) of the swamps, and not the red cedar.

In drawing conclusions from these figures, it is to be noted that the larger the area used the more accurate will the results be; that is, the figures for a county are more accurate than those for a town, and those for the State more accurate than the figures for any county. The columns of per cent. which give the amount of forest land relative to the total area, or the amount of land in each type relative to the total *forest* area, offer a better means of comparing different towns or counties than the figures of acreage.

Thirty-seven per cent. of the acreage of the State is in forest land; but if Suffolk and Nantucket counties are omitted, the percentage is raised to forty. We add to this an amount sufficient to make up for waste land that should be in forest, and we have about fifty per cent. of the total area of the State available for forest purposes.

Barnstable County.

CITY OR TOWN.	Area (Acres).	Forest Area (Acres).	Per Cent.	Pine Types.	Per Cent.	Hard-wood Types.	Per Cent.	Mixed Types.	Per Cent.	Miscella- neous Types.	Per Cent.
Barnstable,	40,367	20,447	51.0	—	—	—	—	15,744 ¹	71.0	4,733 ²	29.0
Bourne, N.	26,584	17,792	67.0	—	—	—	—	14,400	82.0	3,392 ²	18.0
Brewster,	16,103	8,480	53.0	—	—	—	—	8,480 ¹	100.0	—	—
Chatham,	10,442	1,754	17.0	—	—	—	—	1,619	—	135 ²	8.0
Dennis,	14,016	6,496	46.0	—	—	—	—	4,128 ¹	65.0	2,368 ²	35.0
Eastham, J	9,341	2,688	29.0	2,170 ³	95.0	—	—	—	—	520 ²	5.0
Falmouth,	29,260	21,344	73.0	2,790 ³	25.0	—	—	10,976 ¹	50.0	10,368 ²	50.0
Harwich,	14,340	8,800	61.0	2,855 ³	20.0	1,375	10.0	5,120 ¹	65.0	895 ²	10.0
Mashpee,	16,617	13,217	80.0	128 ³	9.0	493	33.0	8,820	70.0	—	—
Orleans,	9,081	1,517	17.0	—	—	64	8.0	896	92.0	—	—
Provincetown,	5,600	960	17.0	—	—	4,450	3.0	18,400	97.0	—	—
Sandwich,	28,033	18,850	67.0	—	—	—	—	160 ⁴	3.0	5,200 ²	97.0
Truro,	13,825	5,360	40.0	1,517 ³	52.0	—	—	320	12.0	990 ²	36.0
Wellfleet,	13,326	2,830	48.0	3,810 ³	40.0	—	—	5,280	45.0	512 ²	15.0
Yarmouth,	16,338	9,600	51.0	—	—	—	—	—	—	—	—
Totals,	263,273	140,135	53.0	13,270	9.4	6,382	4.6	95,207	68.0	29,113	18.0

Berkshire County.

Adams,	14,976	8,436	56.0	416	5.0	90	1.0	7,930	94.0	—	—
Alford,	7,104	2,708	38.0	96	3.0	2,272	84.0	340	13.0	—	—
Becket,	32,896	19,771	60.0	—	—	2,413	12.0	16,583	84.0	775 ⁵	4.0
Cheshire,	18,304	10,419	57.0	1,216	12.0	3,564	34.0	5,287	51.0	352 ⁵	3.0
Clarksburg,	7,936	6,831	76.0	—	—	4,872	74.0	1,959	26.0	—	—
Dalton,	13,824	8,749	63.0	—	—	—	—	8,749	100.0	—	—
Egremont,	12,224	4,896	40.0	512	10.0	3,970	82.0	256	5.0	128 ⁶	3.0
Florida,	12,800	10,389	84.0	—	—	378	3.0	7,136	69.0	2,875 ⁷	28.0
Great Barrington,	31,168	14,377	46.0	256	2.0	11,648	81.0	2,395	17.0	—	—
Hancock,	24,128	15,306	63.0	—	—	14,074	92.0	1,102	7.0	130 ⁷	1.0
Hinsdale,	13,696	8,160	59.0	32	—	—	—	4,608	56.0	3,520 ⁷	44.0
Lanesborough,	18,816	9,205	49.0	1,274	14.0	4,961	54.0	2,560	28.0	410 ⁷	4.0
Lee,	16,256	9,832	60.0	640	6.0	1,051	12.0	8,032	82.0	—	—
Lenox,	15,360	7,900	51.0	832	11.0	4,033	51.0	2,778	36.0	257 ⁵	2.0

Monterey.	17,048	9,672	57.0	1,396	14.0	7,040	73.0	1,236	13.0	—	147 ⁶	1.0
Mount Washington.	14,400	13,132	91.0	352	3.0	12,652	96.0	—	—	—	102 ⁷	2.0
New Ashford.	8,320	6,822	82.0	—	—	—	—	6,720	98.0	—	909 ⁵	6.0
New Marlborough.	30,976	13,690	44.0	800	6.0	4,813	35.0	7,168	53.0	—	221 ⁷	3.0
North Adams.	12,160	6,701	55.0	—	—	941	15.0	5,536	82.0	—	—	—
Otis.	24,192	12,055	50.0	2,227	19.0	6,961	57.0	2,867	24.0	—	4,224 ⁷	50.0
Peru.	17,344	8,480	49.0	—	—	2,848	34.0	1,408	16.0	—	—	—
Pittsfield.	26,944	7,981	29.0	928	12.0	6,061	76.0	3,292	12.0	—	134 ⁶	2.0
Richmond.	11,776	5,862	50.0	736	13.0	1,696	29.0	11,136	56.0	—	—	—
Sandisfield.	33,984	17,984	53.0	192	1.0	6,656	37.0	9,888	71.0	—	28.0	—
Savoy.	25,152	13,875	55.0	96	1.0	—	—	4,384	34.0	—	300 ⁷	3.0
Sheffield.	32,448	12,844	39.0	1,120	9.0	4,736	92.0	—	—	—	128 ⁷	2.0
Stockbridge.	14,144	5,152	36.0	288	6.0	6,668	86.0	749	9.0	—	—	—
Tyringham.	12,800	7,763	61.0	346	5.0	11,494	63.0	4,576	25.0	—	1,741 ⁷	10.0
Washington.	25,280	18,134	72.0	282	2.0	4,525	83.0	928	17.0	—	—	—
West Stockbridge.	11,648	5,453	47.0	—	—	7,552	41.0	8,928	48.0	—	1,869 ⁶	10.0
Williamstown.	31,360	18,477	59.0	128	1.0	5,549	62.0	576	6.0	—	2,701 ⁵	30.0
Windsor.	21,440	9,018	42.0	192	2.0	—	—	—	—	—	—	—
Totals.	630,904	330,074	54.0	14,357	4.0	150,558	47.0	140,099	42.0	—	24,917	7.0

Bristol County.

Acushnet.	12,041	2,778	23.0	698	25.0	—	—	1,184	42.0	—	896 ²	33.0
Attleborough.	17,774	2,804	16.0	96	3.0	1,428	50.0	1,280	47.0	—	—	—
Berkley.	10,496	1,748	17.0	340	20.0	—	—	1,408	80.0	—	—	—
Dartmouth.	39,578	20,606	50.0	640	3.0	6,458	31.0	11,098	54.0	—	2,410 ²	12.0
Dighton.	14,306	1,255	9.0	32	3.0	192	15.0	1,031	82.0	—	—	—
Easton.	18,845	12,194	65.0	39	—	1,440	11.0	7,533	61.0	—	3,182 ²	28.0
Fairhaven.	7,934	1,517	19.0	269	17.0	1,152	77.0	96	6.0	—	—	—
Fall River.	24,372	5,152	21.0	320	6.0	1,984	38.0	1,056	20.0	—	1,792 ⁸	36.0
Freeport.	23,173	6,791	29.0	1,696	25.0	—	—	4,429	85.0	—	666 ⁸	10.0
Mansfield.	13,012	8,000	61.0	83	1.0	896	11.0	6,893	66.0	—	1,440 ⁸	61.0
New Bedford.	12,669	2,432	19.0	192	8.0	—	—	800	33.0	—	653 ²	28.0
North Attleborough.	12,452	2,253	18.0	192	8.0	704	32.0	704	32.0	—	32 ²	—
Norton.	18,817	7,052	38.0	96	1.0	928	14.0	5,996	85.0	—	736 ⁸	10.0
Raynham.	13,263	7,839	59.0	154	2.0	1,760	23.0	5,189	65.0	—	—	—

¹ Pitch pine and hardwoods mixed.³ Pitch pine.⁴ Pitch pine and cedar mixed.⁵ Spruce and hemlock mixed.⁶ Hemlock growth.⁷ Spruce growth.⁸ Cedar swamp.

Bristol County — Concluded.

CITY OR TOWN.	Area. (Acres).	Forest Area (Acres).	Per Cent.	Pine Types.	Per Cent.	Hard-wood Types.	Per Cent.	Mixed Types.	Per Cent.	Miscella- neous Types.	Per Cent.
Rehoboth,	30,372	7,117	23.0	640	12.0	2,250	30.0	4,225	—	—	—
Seekonk,	11,957	1,856	16.0	—	—	147	8.0	1,709	92.0	90 ¹	8.0
Somerset,	5,546	730	13.0	—	—	—	—	640	92.0	—	—
Swansea,	14,587	1,011	7.0	—	—	1,011	100.0	—	—	—	—
Taunton,	31,099	14,445	45.0	160	1.0	2,349	16.0	11,008	77.0	928 ¹	6.0
Westport,	35,349	9,613	27.0	512	5.0	1,325	14.0	6,304	66.0	1,412 ¹	15.0
Totals,	367,642	117,193	32.0	6,149	5.0	24,024	20.0	72,583	68.0	14,300	15.0

Dukes County.

Chilmark,	14,181	3,975	28.0	—	—	—	—	2,995	75.0	980 ¹	25.0
Edgartown,	18,718	6,920	37.0	—	—	2,407	30.0	3,170	48.0	1,345 ¹	22.0
Gay Head,	4,062	378	9.0	—	—	290	75.0	—	—	90 ¹	25.0
Gosnold,	8,286	1,410	17.0	130 ²	9.0	320	21.0	960	70.0	—	—
Oak Bluffs,	4,642	1,568	34.0	—	—	—	—	1,408	90.0	160 ¹	10.0
Tisbury,	4,825	2,080	43.0	—	—	—	60.0	8,000 ²	40.0	—	—
West Tisbury,	17,072	7,455	44.0	192 ²	3.0	1,280	—	1,825	87.0	735 ¹	10.0
Totals,	71,786	23,786	33.0	322	1.5	4,297	17.0	18,358	77.0	3,310	15.0

Essex County.

Amesbury,	8,841	1,961	22.0	519	26.0	1,442	74.0	—	—	—	—
Andover,	20,471	6,375	33.0	954	15.0	4,237	64.0	1,294	21.0	—	—
Beverly,	7,781	3,264	45.0	320	10.0	—	—	2,944	90.0	—	—
Boxford,	15,611	9,668	66.0	868	9.0	5,056	52.0	3,744	39.0	—	—
Danvers,	8,857	1,647	18.0	131	8.0	288	18.0	1,178	74.0	—	—
Essex,	9,201	3,264	35.0	—	—	—	—	3,264	100.0	—	—
Georgetown,	8,496	4,621	54.0	160	4.0	3,341	72.0	1,120	24.0	—	—

Gloucester,	16,929	5,963	35.0	77	1.0	154	3.0	5,732	96.0	-	-
Groveland,	5,994	3,565	60.0	256	7.0	461	13.0	2,848	80.0	-	-
Hamilton,	9,594	3,776	39.0	32	1.0	256	7.0	3,488	92.0	-	-
Haverhill,	22,818	3,207	14.0	576	18.0	935	29.0	1,696	53.0	-	-
Ipswich,	21,340	5,448	26.0	-	-	2,228	40.0	3,220	60.0	-	-
Lawrence,	4,636	1,198	26.0	115	10.0	1,011	84.0	71	6.0	-	-
Lynn,	7,177	2,798	42.0	-	-	-	-	2,798	100.0	-	-
Lynnfield,	6,713	3,514	52.0	-	-	589	17.0	2,925	83.0	-	-
Manchester,	4,940	2,791	57.0	-	-	-	-	2,791	100.0	-	-
Marblehead,	2,831	269	9.0	-	-	-	-	269	100.0	-	-
Merrimac,	5,778	1,946	33.0	378	19.0	448	24.0	1,120	57.0	-	-
Methuen,	14,752	5,070	34.0	96	2.0	2,605	51.0	2,369	47.0	-	-
Middleton,	9,256	6,568	71.0	359	6.0	4,532	69.0	1,677	25.0	-	-
Nahant,	-	-	-	-	-	-	-	-	-	96 ²	4.0
Newbury,	15,577	2,368	15.0	32	1.0	2,240	95.0	-	-	-	-
Newburyport,	5,696	685	12.0	256	37.0	429	63.0	-	-	-	-
North Andover,	17,810	7,277	41.0	160	2.0	6,669	92.0	448	6.0	-	-
Peabody,	10,758	4,717	44.0	352	7.0	4,365	93.0	-	-	-	-
Rockport,	4,529	1,010	22.0	58	6.0	37	4.0	915	90.0	-	-
Rowley,	12,180	2,415	20.0	-	-	1,103	46.0	1,312	54.0	-	-
Salem,	5,233	2,077	40.0	-	-	-	-	384	18.0	-	-
Salisbury,	10,325	2,446	24.0	-	-	96	4.0	2,350	96.0	-	-
Saugus,	7,412	2,112	28.0	-	-	544	26.0	1,568	74.0	-	-
Swampscott,	1,981	864	44.0	-	-	-	-	864	100.0	-	-
Topsfield,	8,228	2,650	32.0	154	6.0	301	11.0	2,195	83.0	-	-
Wenham,	5,252	1,241	24.0	38	3.0	-	-	1,203	97.0	-	-
West Newbury,	9,381	1,062	11.0	-	-	1,062	100.0	-	-	-	-
Totals,	326,660	108,537	33.0	5,891	4.0	44,429	43.0	55,787	51.0	2,688	2.0

Franklin County.

Ashfield,	25,408	9,325	37.0	128	1.0	2,208	24.0	6,989	75.0	-	-
Barnardston,	14,144	4,864	34.0	32	-	-	-	4,832	100.0	-	-
Buckland,	12,864	5,908	46.0	-	-	-	-	5,908	100.0	-	-
Charmont,	16,896	8,052	48.0	-	-	-	-	8,052	100.0	-	-
Colrain,	20,480	15,866	77.0	-	-	6,464	41.0	9,402	59.0	-	-
Conway,	24,128	10,708	44.0	192	2.0	5,172	48.0	5,344	50.0	-	-

¹ Scrub growth.² Pitchpine.³ Cedar swamp.

Franklin County — Concluded.

CITY OR TOWN.	Area (Acres).	Forest Area (Acres).	Per Cent.	Pine Types.	Per Cent.	Hard-wood Types.	Per Cent.	Mixed Types.	Per Cent.	Miscella- neous Types.	Per Cent.
Deerfield,	22,528	9,511	42.0	423	5.0	—	—	9,088	95.0	—	—
Erving, .	9,216	3,873	42.0	77	2.0	1,044	28.0	2,732	70.0	—	—
Gill,	9,344	1,613	17.0	480	29.0	877	54.0	256	17.0	—	—
Greenfield,	12,800	2,624	21.0	—	—	448	16.0	2,176	84.0	—	—
Hawley, .	19,712	9,184	47.0	—	—	768	9.0	8,416	91.0	—	—
Heath, .	16,000	5,549	35.0	—	—	960	17.0	4,589	83.0	—	—
Leverett, .	14,232	6,356	45.0	256	4.0	448	7.0	5,652	89.0	—	—
Leyden, .	18,240	3,956	22.0	—	—	1,204	32.0	2,752	68.0	—	—
Monroe, .	7,104	4,397	62.0	—	—	173	4.0	2,317	53.0	—	—
Montague,	19,456	4,841	24.0	—	—	1,184	24.0	3,657	76.0	—	—
New Salem,	19,264	9,018	46.0	3,789	38.0	813	9.0	4,416	43.0	1,907 ¹	43.0
Northfield,	22,784	6,650	29.0	288	4.0	2,599	39.0	3,763	57.0	880 ²	9.0
Orange, .	23,684	10,208	43.0	1,683	17.0	4,096	40.0	4,429	43.0	—	—
Rowe, .	15,424	6,816	44.0	—	—	288	4.0	6,528	96.0	—	—
Shelburne,	15,104	6,720	44.0	384	6.0	—	—	8,336	94.0	—	—
Shutesbury,	17,024	9,479	55.0	115	1.0	429	4.0	8,935	95.0	—	—
Sunderland,	8,960	1,472	17.0	128	1.0	—	—	1,344	99.0	—	—
Warwick,	23,936	10,112	42.0	1,824	18.0	435	4.0	7,853	78.0	—	—
Wendell,	20,672	5,664	27.0	474	9.0	2,592	45.0	2,598	46.0	—	—
Whately, .	12,160	1,683	14.0	—	—	1,683	100.0	—	—	—	—
Totals,	441,560	224,849	50.0	10,273	4.0	34,085	39.0	128,385	57.0	2,787	2.0

Hampden County.

Agawam,	16,000	2,996	19.0	352	11.0	1,364	46.0	1,280	43.0	—	—
Blandford,	33,920	13,550	40.0	429	4.0	7,271	53.0	5,850	43.0	—	—
Brimfield,	22,528	8,385	37.0	224	3.0	3,533	42.0	4,628	55.0	—	—
Chester, .	23,040	12,096	52.0	—	—	7,424	61.0	4,672	39.0	—	—
Chicopee,	16,448	2,292	14.0	84	4.0	2,112	92.0	—	—	96 ³	4.0
East Longmeadow,	8,576	590	7.0	276	49.0	150	22.0	164	29.0	—	—
Granville,	28,992	10,977	38.0	160	1.0	564	5.0	10,253	94.0	—	—
Hampden,	12,160	4,365	36.0	52	1.0	473	11.0	3,840	88.0	—	—

Holland, .	8,640	3,733	43.0	135	4.0	3,213	86.0	365	10.0	—
Holyoke, .	10,752	2,794	26.0	—	—	—	—	2,794	100.0	—
Longmeadow, .	7,168	310	4.0	32	10.0	182	59.0	96	31.0	—
Ludlow, .	18,048	1,965	11.0	269	19.0	768	34.0	928	47.0	—
Monson, .	30,592	9,780	32.0	141	2.0	7,495	76.0	2,144	22.0	—
Montgomery, .	9,600	8,032	83.0	—	—	—	—	8,032	100.0	—
Palmer, .	20,800	10,093	48.0	128	1.0	9,965	99.0	—	—	—
Russell, .	12,160	6,266	51.0	—	—	1,152	18.0	4,570	73.0	19.0
Southwick, .	14,784	3,552	24.0	—	—	1,517	43.0	2,035	57.0	20.0
Springfield, .	20,608	6,106	29.0	—	—	—	—	4,890	80.0	—
Tolland, .	20,032	9,498	47.0	1,632	17.0	1,024	11.0	6,842	72.0	—
Wales, .	10,624	2,432	23.0	—	—	2,144	88.0	288	12.0	—
West Springfield, .	11,712	2,306	20.0	102	5.0	192	8.0	2,012	87.0	—
Westfield, .	31,040	2,912	8.0	—	—	128	5.0	2,784	95.0	—
Wilbraham, .	14,720	2,891	20.0	—	—	1,427	49.0	1,402	49.0	2.0
Totals, .	412,934	127,891	31.0	4,016	6.0	52,998	41.0	69,870	51.0	1,822
										2.0

Hampshire County.

Amherst, .	17,280	2,663	15.0	228	11.0	1,485	56.0	890	33.0	—
Belchertown, .	35,264	13,415	38.0	365	3.0	3,021	22.0	10,029	75.0	—
Chesterfield, .	20,736	8,224	39.0	—	—	1,888	23.0	6,336	77.0	—
Cummington, .	14,592	10,973	75.0	—	—	—	—	10,480	96.0	4.0
Easthampton, .	9,152	2,976	32.0	—	—	—	—	2,976	100.0	—
Enfield, .	11,200	5,005	45.0	—	—	2,861	57.0	2,144	43.0	—
Goshen, .	10,944	3,905	36.0	244	6.0	589	16.0	3,070	78.0	—
Granby, .	17,600	4,295	24.0	—	—	2,727	63.0	1,568	37.0	—
Greenwich, .	12,800	3,648	29.0	—	—	704	20.0	2,944	80.0	—
Hadley, .	15,872	1,691	11.0	—	—	302	18.0	1,389	82.0	—
Hatfield, .	11,072	3,520	32.0	—	—	—	—	3,520	100.0	—
Huntington, .	17,408	7,060	40.0	—	—	2,208	32.0	4,852	68.0	—
Middlefield, .	15,488	9,792	63.0	—	—	3,680	38.0	6,112	62.0	—
Northampton, .	25,920	7,277	28.0	—	—	7,277	100.0	—	—	—
Pelham, .	16,064	7,654	47.0	—	—	832	12.0	6,822	88.0	8.0
Plainfield, .	13,952	6,618	47.0	—	—	96	1.0	5,997	91.0	—
Prescott, .	11,712	4,339	37.0	832	19.0	—	—	3,507	81.0	—
South Hadley, .	11,840	2,720	23.0	—	—	—	—	2,720	100.0	—

¹ Spruce growth.² Pitch pine.³ Hemlock growth.⁴ Spruce and hemlock mixed.

Hampshire County — Concluded.

CITY OR TOWN.	Area (Acres).	Forest Area (Acres).	Per Cent.	Pine Types.	Per Cent.	Hard-wood Types.	Per Cent.	Mixed Types.	Per Cent.	Miscella- neous Types.	Per Cent.
Southampton, . . .	17,472	10,983	63.0	—	—	—	—	10,983	100.0	—	—
Ware, . . .	18,752	2,904	15.0	—	—	1,619	56.0	1,285	44.0	—	—
Westhampton, . . .	17,792	11,712	65.0	—	—	11,712	100.0	—	—	—	—
Williamsburg, . . .	16,320	8,730	53.0	448	5.0	5,191	58.0	3,091	37.0	—	—
Worthington, . . .	20,800	6,893	33.0	96	1.0	806	13.0	5,991	86.0	—	—
Totals, . . .	380,032	146,997	38.0	2,213	2.0	46,998	32.0	96,706	65.0	1,018	1.0

Middlesex County.

CITY OR TOWN.	Area (Acres).	Forest Area (Acres).	Per Cent.	Pine Types.	Per Cent.	Hard-wood Types.	Per Cent.	Mixed Types.	Per Cent.	Miscella- neous Types.	Per Cent.
Acton, . . .	12,999	2,603	20.0	640	24.0	1,213	46.0	750	30.0	—	—
Arlington, . . .	3,577	369	10.0	—	—	231	63.0	138	37.0	—	—
Ashby, . . .	14,912	5,372	36.0	660	12.0	2,580	48.0	2,132	40.0	—	—
Ashland, . . .	23,037	1,726	8.0	26	1.0	1,501	87.0	199	12.0	—	—
Ayer, . . .	5,980	3,003	50.0	218	7.0	1,754	59.0	1,031	34.0	—	—
Bedford, . . .	8,867	4,378	49.0	480	11.0	1,818	42.0	2,080	47.0	—	—
Belmont, . . .	2,981	674	22.0	—	—	1,674	100.0	—	—	—	—
Billerica, . . .	16,617	6,772	41.0	538	9.0	2,432	35.0	3,802	56.0	—	—
Boxborough, . . .	6,648	3,021	45.0	224	7.0	941	31.0	1,856	62.0	—	—
Burlington, . . .	7,603	2,881	38.0	116	4.0	1,325	46.0	1,440	50.0	—	—
Cambridge, . . .	4,570	—	—	—	—	—	—	—	—	—	—
Carlisle, . . .	9,884	4,071	41.0	160	4.0	1,287	32.0	2,624	64.0	—	—
Chelmsford, . . .	14,693	5,768	32.0	960	17.0	3,124	55.0	1,684	28.0	—	—
Concord, . . .	16,492	4,705	46.0	461	10.0	4,052	86.0	192	4.0	—	—
Dracut, . . .	13,631	7,021	51.0	365	5.0	2,368	33.0	4,288	62.0	—	—
Dunstable, . . .	10,993	3,060	28.0	52	2.0	1,120	38.0	1,888	60.0	—	—
Everett, . . .	2,396	—	—	—	—	—	—	—	—	—	—
Framingham, . . .	45,408	5,155	11.0	16	—	1,407	28.0	3,732	72.0	—	—
Groton, . . .	17,278	5,741	33.0	—	—	3,136	55.0	2,605	45.0	—	—
Holliston, . . .	39,947	4,247	16.0	160	4.0	2,592	61.0	1,495	35.0	—	—
Hopkinton, . . .	17,408	7,022	43.0	224	3.0	5,940	85.0	653	9.0	205 ¹	3.0
Hudson, . . .	7,559	40.0	52	2.0	2.0	2,226	73.0	756	25.0	—	—
Lexington, . . .	10,641	2,400	23.0	192	8.0	1,344	56.0	864	36.0	—	—

Lincoln, .	9,550	3,693	37.0	-	-	2,637	71.0	1,056	29.0	-
Littleton, .	11,104	4,176	43.0	4.0	-	2,944	63.0	1,600	33.0	-
Lowell, .	7,941	1,732	15.0	33.0	384	435	85.0	353	30.0	-
Malden, .	3,285	717	22.0	11.0	77	608	85.0	32	4.0	-
Marlborough, .	14,105	3,399	24.0	8.0	263	2,848	84.0	288	8.0	-
Maynard, .	3,426	1,427	41.0	-	-	659	46.0	768	54.0	-
Medford, .	5,632	2,176	39.0	-	-	-	-	2,176	100.0	-
Melrose, .	3,070	1,472	46.0	17.0	256	352	24.0	864	59.0	-
Natick, .	28,426	2,112	7.0	-	-	2,112	100.0	-	-	-
Newton, .	18,331	1,562	8.0	5.0	77	1,197	77.0	288	18.0	-
North Reading, .	8,661	4,832	56.0	-	-	-	-	4,832	100.0	-
Pepperell, .	14,711	5,729	39.0	11.0	640	4,596	81.0	493	8.0	-
Reading, .	6,306	2,017	32.0	11.0	224	807	40.0	986	49.0	-
Sherborn, .	30,440	3,670	12.0	10.0	320	1,216	32.0	2,134	58.0	-
Shirley, .	14,241	3,616	25.0	-	-	1,139	31.0	2,477	69.0	-
Somerville, .	2,634	-	-	-	-	-	-	-	-	-
Stoneham, .	4,264	2,016	47.0	-	-	-	-	2,016	100.0	-
Stow, .	11,478	3,328	29.0	12.0	416	1,220	37.0	1,792	51.0	-
Sudbury, .	15,677	6,016	38.0	18.0	1,120	1,408	24.0	3,488	58.0	-
Tewksbury, .	14,531	6,758	46.0	20.0	1,344	2,630	39.0	2,784	41.0	-
Townsend, .	20,608	7,745	37.0	9.0	643	1,959	21.0	5,496	61.0	-
Tyngsborough, .	11,427	3,571	31.0	-	-	915	24.0	2,656	76.0	-
Wakefield, .	5,047	1,779	35.0	1.0	19	192	11.0	1,024	88.0	-
Waltham, .	8,650	3,727	43.0	-	15	3,712	100.0	-	-	-
Watertown, .	2,670	160	6.0	-	-	160	100.0	-	-	-
Wayland, .	10,160	1,760	17.0	-	-	1,440	82.0	320	18.0	-
Westford, .	19,838	7,053	35.0	9.0	685	704	10.0	5,664	71.0	-
Weston, .	11,111	6,093	55.0	10.0	640	1,409	22.0	4,044	68.0	-
Wilmington, .	10,959	3,917	36.0	30.0	1,248	704	20.0	1,965	50.0	-
Winchester, .	4,018	967	24.0	-	-	-	-	967	100.0	-
Woburn, .	8,388	2,419	28.0	7.0	166	205	8.0	2,048	85.0	-
Totals,	657,831	182,662	28.0	10.0	14,050	31,077	44.0	86,819	46.0	0.5

Nantucket County.

Nantucket, .	32,221	1,164	3.6	95.0	1,100 ²	-	-	64	5.0	-
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¹ Cedar swamp.² Pitch pine.

Norfolk County.

CITY OR TOWN.	Area (Acres).	Forest Area (Acres).	Per Cent.	Pine Types.	Per Cent.	Hard-wood Types.	Per Cent.	Mixed Types.	Per Cent.	Miscella- neous Types.	Per Cent.
Avon,	2,876	1,357	47.0	—	—	435	31.0	922	69.0	—	—
Bellingham,	12,073	5,952	49.0	416	6.0	2,096	68.0	1,440	26.0	—	—
Braintree,	9,223	3,911	42.0	39	1.0	2,688	67.0	1,184	32.0	—	—
Brookline,	4,367	—	—	—	—	—	—	—	—	—	—
Canton,	12,404	6,883	56.0	352	5.0	6,051	88.0	480	7.0	—	—
Cohasset,	6,438	3,008	46.0	—	—	2,336	77.0	672	23.0	—	—
Dedham,	10,790	2,279	21.0	—	—	—	—	2,279	100.0	—	—
Dover,	15,306	5,933	39.0	—	—	3,213	54.0	2,720	46.0	—	—
Foxborough,	23,412	6,464	28.0	—	—	—	—	6,464	100.0	—	—
Franklin,	17,282	8,604	49.0	276	3.0	916	10.0	7,412	87.0	—	—
Holbrook,	4,687	3,200	67.0	—	—	—	—	3,200	100.0	—	—
Hyde Park,	2,932	724	24.0	—	—	—	—	724	100.0	—	—
Medfield,	9,293	2,875	31.0	692	24.0	589	20.0	1,434	51.0	160 ¹	5.0
Medway,	7,463	3,412	45.0	64	2.0	1,856	54.0	1,492	44.0	—	—
Millis,	7,850	3,648	46.0	51	1.0	3,136	87.0	461	12.0	—	—
Milton,	8,448	3,853	45.0	64	2.0	3,789	98.0	—	—	—	—
Needham,	12,752	2,496	19.0	—	—	2,496	100.0	—	—	—	—
Norfolk,	9,825	3,597	36.0	365	10.0	704	19.0	2,528	71.0	—	—
Norwood,	6,780	1,376	20.0	—	—	1,376	100.0	—	—	—	—
Plainville, ²	—	—	—	—	—	—	—	—	—	—	—
Quincy,	10,648	3,955	37.0	32	1.0	736	18.0	3,187	81.0	—	—
Randolph,	6,608	3,904	59.0	—	—	896	23.0	3,008	77.0	—	—
Sharon,	15,557	9,728	62.0	—	—	—	—	9,728	100.0	—	—
Stoughton,	10,492	5,664	53.0	—	—	2,848	50.0	2,816	50.0	—	—
Walpole,	13,498	7,187	53.0	—	—	2,240	31.0	4,947	69.0	—	—
Westwood,	10,514	2,496	24.0	—	—	2,496	100.0	—	—	—	—
Westwood,	11,243	3,213	29.0	—	—	288	7.0	3,213	100.0	—	—
Weymouth,	11,348	4,289	38.0	20	—	5,062	46.0	3,872	91.0	109 ¹	2.0
Wrentham,	14,516	10,918	50.0	512	5.0	—	—	5,344	49.0	—	—
Totals,	295,975	120,916	41.0	2,883	2.0	48,247	43.0	69,527	55.0	289	0.5

Plymouth County.

Abington,	.	.	.	67.0	32	1.0	1,920	44.0	506	12.0	1,895 ³	43.0
Bridgewater,	.	.	.	45.0	20	—	2,957	36.0	4,871	59.0	346 ³	53.0
Brookton,	.	.	.	28.0	15	—	743	19.0	1,088	28.0	2,068 ³	67.0
Carver,	.	.	.	24.0	640	11.0	—	—	1,376	22.0	4,064 ³	6.0
Duxbury,	.	.	.	61.0	128	1.0	—	—	8,912	93.0	558 ³	6.0
East Bridgewater,	.	.	.	44.0	237	5.0	—	—	4,557	91.0	224 ³	4.0
Halifax,	.	.	.	31.0	864	25.0	—	—	2,117	43.0	416 ¹	12.0
Hanover,	.	.	.	74.0	—	—	—	—	6,458	85.0	1,088 ³	15.0
Hanson,	.	.	.	72.0	—	—	—	—	7,232	100.0	—	—
Hingham,	.	.	.	35.0	39	1.0	—	—	4,704	92.0	352 ³	7.0
Hull,	.	.	.	6.0	—	—	—	—	—	—	96 ³	100.0
Kingston,	.	.	.	68.0	621	7.0	—	—	2,746	33.0	5,152 ³	60.0
Lakeville,	.	.	.	16.0	525	14.0	—	54.0	621	17.0	544 ¹	15.0
Marion,	.	.	.	36.0	768	20.0	—	—	2,612	80.0	—	—
Marshfield,	.	.	.	49.0	—	—	—	—	8,576	96.0	356 ³	4.0
Mattapoisett,	.	.	.	49.0	1,760	32.0	—	—	3,744	68.0	—	—
Middleborough,	.	.	.	23.0	1,664	9.0	—	—	13,107	69.0	—	—
Norwell,	.	.	.	59.0	50	—	—	34.0	6,125	55.0	1,907 ³	10.0
Pembroke,	.	.	.	27.0	141	3.0	—	—	3,622	12.0	2,285 ¹	11.0
Plymouth,	.	.	.	23.0	130	—	—	—	27,038	90.0	1,056 ³	7.0
Plympton,	.	.	.	33.0	205	6.0	—	—	3,008	100.0	275 ³	—
Rockester,	.	.	.	42.0	3,040	31.0	—	—	6,784	94.0	—	—
Rockland,	.	.	.	58.0	—	—	—	—	1,600	69.0	—	—
Scituate,	.	.	.	34.0	—	—	—	—	2,432	42.0	2,176 ³	58.0
Wareham,	.	.	.	31.0	2,432	32.0	—	34.0	3,968	66.0	—	—
West Bridgewater,	.	.	.	47.0	96	2.0	—	49.0	2,264	52.0	1,165 ³	16.0
Whitman	.	.	.	45.0	19	1.0	—	19.0	141	7.0	224 ³	4.0
Totals,	.	.	.	30.0	13,426	7.0	15,483	8.0	129,340	69.0	1,504 ³	73.0
											26,695	15.0

¹ Cedar swamp.² Part of Wrentham. See that town. Area, 7,350 acres.³ Scrub growth.

Suffolk County.

CITY OR TOWN.	Area (Acres).	Forest Area (Acres).	Per Cent.	Pine Types.	Per Cent.	Hard-wood Types.	Per Cent.	Mixed Types.	Per Cent.	Miscella- neous Types.	Per Cent.
Boston, .	26,026	2,571	10.0	-	-	1,672	65.0	166	4.0 {	413 ¹ 320 ²	17.0 14.0
Chelsea, .	3,543	-	-	-	-	-	-	-	-	-	-
Revere, .	4,045	117	3.0	24	20.0	93	80.0	-	-	-	-
Winthrop, .	2,432	-	-	-	-	-	-	-	-	-	-
Totals, .	36,046	2,688	7.4	24	5.7	1,765	65.6	166	6.0	733	23.0

Worcester County.

CITY OR TOWN.	Area (Acres).	Forest Area (Acres).	Per Cent.	Pine Types.	Per Cent.	Hard-wood Types.	Per Cent.	Mixed Types.	Per Cent.	Miscella- neous Types.	Per Cent.
Ashburnham, .	26,624	14,375	54.0	282	2.0	8,960	62.0	5,133	36.0	-	-
Athol, .	22,016	13,647	62.0	283	2.0	6,982	51.0	5,402	47.0	-	-
Auburn, .	9,050	3,719	41.0	160	4.0	3,559	96.0	-	-	-	-
Barre, .	29,248	13,056	45.0	384	3.0	-	-	12,672	97.0	-	-
Berlin, .	8,437	1,534	18.0	135	9.0	141	9.0	1,248	82.0	-	-
Blackstone, .	10,406	5,874	56.0	-	-	5,202	89.0	672	11.0	-	-
Bolton, .	12,790	2,106	16.0	288	14.0	288	14.0	1,530	72.0	-	-
Boylston, .	6,653	6,653	53.0	374	6.0	6,279	94.0	-	-	-	-
Brookfield, .	17,728	6,183	35.0	941	15.0	1,128	2.0	5,114	83.0	-	-
Brookline, .	28,132	14,900	53.0	1,194	8.0	13,166	88.0	640	4.0	-	-
Clinton, .	4,617	514	11.0	-	-	481	94.0	33	6.0	-	-
Dana, .	12,544	4,078	33.0	-	-	334	8.0	3,744	83.0	450 ¹	9.0
Douglas, .	24,128	16,810	70.0	576	3.0	14,067	84.0	2,176	13.0	-	-
Dudley, .	14,272	3,610	25.0	-	-	2,016	56.0	1,594	44.0	-	-
Fitchburg, .	18,240	3,328	18.0	800	24.0	1,696	51.0	832	25.0	-	-
Gardner, .	14,784	4,846	33.0	992	20.0	2,650	55.0	1,204	25.0	-	-
Grafton, .	14,929	4,128	27.0	-	-	4,128	100.0	-	-	-	-
Hardwick, .	25,600	8,212	32.0	-	-	237	3.0	7,975	97.0	-	-
Harvard, .	3,770	3,770	22.0	-	-	256	7.0	3,354	89.0	-	-
Holden, .	23,166	7,680	33.0	160	4.0	7,604	99.0	-	-	-	-
Hopedale, .	3,372	1,031	31.0	76	1.0	1,031	100.0	-	-	-	-
Hubbardston, .	26,692	13,012	58.0	3,469	27.0	7,719	59.0	1,824	14.0	-	-
Lancaster, .	18,112	6,717	37.0	384	6.0	4,367	65.0	1,966	29.0	-	-

Summary by Counties.

COUNTY.	Area (Acres).	Forest Area (Acres).	Per Cent.	Pine Types.	Per Cent.	Hard-wood Types.	Per Cent.	Mixed Types.	Per Cent.	Miscella- neous Types.	Per Cent.
Barnstable,	263,273	140,135	53.0	13,270 ¹	9.4	6,382	4.6	95,207	68.0	29,113 ²	18.0
Berkshire,	630,904	330,074	54.0	14,357	4.0	150,558	47.0	140,099	42.0	24,074 ³	7.0
Bristol,	367,642	117,193	32.0	6,149	5.0	24,024	20.0	72,583	68.0	8,452 ⁴	5.0
Dukes,	71,786	23,786	33.0	322 ¹	1.5	4,297	17.0	18,358	66.0	7,906 ²	2.0
Essex,	326,660	108,537	33.0	5,891	4.0	44,429	43.0	55,787	51.0	1,306 ³	15.5
Franklin,	441,560	224,850	50.0	10,273	4.0	34,085	39.0	128,385	57.0	1,907 ⁴	2.0
Hampden,	412,934	127,890	31.0	4,016	6.0	52,998	41.0	69,870	51.0	1,260 ⁵	-
Hampshire,	380,032	146,997	38.0	2,213	2.0	46,998	32.0	96,706	65.0	1,216 ⁶	1.0
Middlesex,	657,830	182,662	28.0	14,050	10.0	81,077	44.0	86,820	46.0	1,018 ⁷	1.0
Nantucket,	32,220	1,164	3.6	1,100 ¹	94.0	-	-	64	6.0	269 ²	-
Norfolk,	295,975	120,916	41.0	2,883	2.0	48,247	43.0	69,527	55.0	23,450 ³	14.0
Plymouth,	635,363	188,937	30.0	13,426	7.0	15,483	8.0	129,340	69.0	3,245 ⁴	2.0
Suffolk,	36,046	2,688	7.4	24	0.9	1,765	65.6	166	6.0	413 ⁵	22.7 ⁸
Worcester,	994,560	372,780	37.0	26,597	7.0	222,923	60.0	122,048	33.0	320 ⁶	-
State,	5,321,787	1,972,950	37.7	100,015	5.1	731,594	36.9	1,084,793	52.0	29,420 ⁴	-
Total,	-	-	-	-	-	-	-	-	-	11,025 ⁵	-
										16,100 ⁶	-
										65,021 ²	-
										121,566	6.0

¹ Pitch pine.
² Scrub growth.

³ White pine.
⁴ Spruce and hemlock mixed.

⁵ Cedar swamp.
⁶ Spruce growth.

⁷ Hemlock growth.
⁸ Miscellaneous

PINE TREE BLIGHT.

There has been much concern over a condition of the pine trees during the past season. A small number of the white pine trees in every section of the State have been affected with a malady which has caused the tips of the needles to turn brown and die. Trees thus affected were very conspicuous, and during midseason, when it was very dry, they took on a very unhealthy appearance. Some trees were more pronounced than others, depending upon just how far down the needles from the tip the so-called "blight" had spread. All trees, however, even though slightly affected, showed sickly characteristics, in that even the remaining live portions of the tree were lighter in color, and the current seasons growth was much impaired. Both large and small trees were equally troubled, but it was quite noticeable that almost invariably those trees showing the naturally weaker vitality in their struggles for existence were the ones affected. Trees that are badly affected are sure to die, as the evergreens cannot withstand defoliation, in this respect differing from deciduous trees.

As soon as the fall rains came, these trees took on a better color, and the reddish tips, so characteristic during the summer, became inconspicuous or dropped off, so that at present the trouble is not so noticeable. Whether this blight will be as bad again next season is problematical. Trees that have been affected the past season will undoubtedly show the effects in retarded growth and vitality next; and, should the trouble reassert itself, it will probably be advisable to utilize them for timber or wood. In the case of small trees which occur here and there it would be advisable to cut and burn them, as a precautionary method.

The following interview, which appeared in the Boston "Transcript," Aug. 20, 1907, gives a very clear statement of our study of the disease:—

There is much speculation throughout the State as to how serious will be this blight. Land owners who see their trees dying are writing to the State Forester on the subject, asking for information and advice; and it is apparent that it is causing deep concern. In some instances it has attacked favorite trees which from important features of ornamental schemes in parks and on private estates, and large sums of money

have been offered for treatment that shall save them and cure them. It has been the subject, also, of much scientific study, resulting in conclusions that are somewhat reassuring.

Authorities do not quite agree on the question of time within which it made its appearance in Massachusetts. Some say they have noticed it here for about eight years, while others maintain that its first appearance was three years ago; but they are agreed in the verdict that it is more prevalent this year than in any previous season. Hence the question is raised, Is the disease contagious?

On that particular point State Forester Rane is strongly convinced by his own observations. He has toured certain sections of the State thoroughly in quest of information on that subject, and has studied the woodlands to see what relation one dying tree might have to another. One of his assistants also has made a study in the field, and it is believed that when all the data are pieced together Professor Rane will find it possible to send a reassuring communication on the subject to the land owners.

From all that is at hand to-day, the most logical conclusion is that it is not contagious; and Professor Rane, moreover, ventures to say that it is highly improbable that the disease will spread. It will not be as bad next year as it is now, he thinks. In the first place, he finds blighted pines in the midst of a pine grove, with a few trees practically killed and the others not at all touched by it. A perfectly fresh seedling may be found side by side with a matured tree that is dying, and *vice versa*, showing that the disease does not spread from one tree to another, and has no preferences based on the age of a pine.

If one tree is more susceptible to an attack than another, it is the naturally dry and unhealthy, consumptive-looking pine, that shows every sign of being underfed; and from this the deduction is drawn that the strong tree withstands and the weak one yields, when exposed to soil and weather conditions that may be productive of the disease. While it is most common on the white pine, it sometimes attacks the pitch pine also, but it is not as common as many persons may have been led to believe. The State Forester, after his investigation, ventured the estimate that the number of affected pines in the State constitute only a fraction of one per cent of the pine stand, but as yet there are no figures available to qualify this estimate. There is enough of it to give rise to apprehension for the pine forest interest, which is one of growing importance in Massachusetts.

State Forester Rane assigned one of his assistants, B. C. Noyes, the other day to go to Winchendon, whence came many inquiries about the disease, to study the condition in that vicinity, and Mr. Noyes makes this report on the subject: "The blight is found on the pines of all ages. Beginning at the tip of the needle, it works downward and gradually spreads over the whole tree. Trees of weak vitality are most liable to be affected. The blight is undoubtedly due to the unusually cold spring,

followed by excessively hot weather and a period of drought. It has been noticed for several years, but much more so at the present time."

Mr. Charles Bosworth of Winchendon says: "I have noticed the blight for six or eight years, and do not think it serious. This year I noticed it first on one or two trees in the grove in front of my house. These trees are now recovered, while others are affected. In three or four weeks' time I think it will be entirely gone."

Mr. White of Winchendon says: "I have noticed the blight for a long time. One old pine has been in nearly this same condition every year for the past ten years. I do not think it is serious."

Mr. W. H. Brown of Winchendon says: "About two years ago we purchased a tract of growing pine of about six or seven acres. The trees, about a foot high, were at the time pretty generally attacked with the blight, and we hesitated in buying it, on that account. We bought it, however, and to-day it is a thrifty growth, only a few pines being attacked."

Mr. J. G. Folsom, tree warden, says: "I first noticed the blight about six years ago. Just above the village there were several trees affected on both sides of the road. I watched it for two years, and did not notice any increase. The timber on one side was then cut off, but now I cannot find any trace on the trees on the opposite side."

One suggestion as to the cause of it is that some insect has attacked the trees; but in the investigation thus far made nothing has been discovered to substantiate that proposition. There is no sign of animal life on the dead needles, nor have the needles been stung before withering.

Early in the season Professor Rane communicated with Dr. G. E. Stone, at the Hatch Experiment Station, and in a reply to one of the State Forester's letters Dr. Stone writes on the subject as follows: "This trouble has been common since the cold winter of three years ago. I had opportunities to investigate it at that time, and the next year it commenced to show very badly on trees in the form of sun scald, and in the winter in the form of fungi. There were half a dozen fungi found on the pine, but in my estimation all of these were merely the result of the weakened condition of the trees, owing to the severe winter. Dr. Hermann von Schenck and others agree with me.

"My diagnosis of the trouble is as follows: During that cold winter an enormous number of trees were injured, both above and below the ground. I have seen acres of trees, like birches, alders, apple, cherry and a whole host of others, injured at the same time. The pine was injured below as well as above the ground, and I have dug up their roots year after year and found the small ones dead. . . . There was quite a large percentage of the small roots which died, and the dry summer was too hard for them; consequently, the trees suffered from sun scald, and as a result of this and the dying of the tips of the leaves fungi came in after-

ward. . . . I have had trees under observation since that winter, and know of a great many which have recovered entirely. I gathered specimens of certain trees for my laboratory which are absolutely recovered. This has occurred in all cases where the tips of the leaves were burned back only slightly, but when the needles were killed outright there was no recovery of course.

"I had a great many opportunities to observe this in trees planted in rows and growing in forests, and there was absolutely no indication of any contagion, showing that the fungus was a purely secondary matter. In the Middlesex Fells I found about a dozen of these trees two years ago, and made a careful examination of them, but they were isolated from one another in all cases.

"I have been in consultation with some of the authorities in Washington in regard to this trouble, since I have had a large number of specimens to examine, and do not think there is any difference in our diagnosis. This trouble is also found in other portions of New England, Connecticut and Vermont, and I believe it has been reported in New Hampshire."

Some spraying for this disease has been done in Massachusetts, though it is not now believed that such treatment is of any great value. The trees may be saved, however, says State Forester Rane, if treated in time with the right kind of fertilizer. In case most of the needles on the tree are destroyed, the tree cannot be saved by any kind of treatment; and the forester's advice to the owners of such tree is that they cut it down before it dies if there is lumber in it worth saving. If it is only slightly touched, it may possibly be revived. Three pounds of nitrate of soda to a good-sized tree, spread over the ground as far as the branches reach, will give it vigor enough to get out of the effects of the disease attack.

This remedy has been practised by H. L. Frost & Co., tree specialists of Boston, with good success for several years.

EQUIPMENT.

During the past year the State Forester has found it necessary to have some additional equipment for carrying on his work. The principal additions are: two field hand cameras; one surveyor's level; two hypsometers; two aneroid barometers; two right angle finders; a pedometer; a set of book cases and files; and other smaller field implements and drafting room supplies.

CHANGES IN ASSISTANTS.

The State Forester has been very fortunate in having a corps of efficient assistants throughout the year. The only deplorable

fact is that, as is the usual case, as soon as one's assistants demonstrate their value they are sought after.

Mr. J. J. Dearborn, who has been an assistant in demonstrating practical forestry methods over the State, has done his work so well that the Diamond Match Company has engaged him as their forestry expert. Mr. Dearborn's resignation takes effect February 1.

While the State Forester will miss the valuable service of Mr. Dearborn, he nevertheless will be located with headquarters at Athol in this State and continue in a way to serve the State, although through a private enterprise. The success of Mr. Dearborn can be construed in no other way than a compliment to the effective work of this office during the past year.

Mr. B. C. Noyes, who was also connected with the service until recently, has resigned to accept a position with the firm of H. L. Frost & Co. of Boston.

EXPENDITURES AND RECEIPTS.

In accordance with section 6 of chapter 409 of the Acts of 1904, as amended by the Acts of 1907, chapter 473, section 2, the following statement is given of the expenditures for the year ending November 30:—

Salaries of assistants,	\$3,189 63
Travelling expenses (not included in co-operative funds),	935 60
Instruments,	196 46
Stationery and other office supplies,	293 08
Printing,	875 67
Postage,	283 30
Miscellaneous,	154 55
Nursery,	1,081 96
Total,	\$7,010 25

There was realized from the sale of seedlings already referred to \$235.50, which amount has been turned over to the Treasurer and Receiver-General.

In accordance with section 5 of the above-named chapter, the following statement is given of the receipts for travelling and subsistence:—

I. For Lectures.

Everett Grange, Everett,	\$2 50
West Newbury Grange, West Newbury,	1 87
State Board of Agriculture, Springfield,	4 75
Public Lecture, Sterling,	3 00
Civic Club, Gleasondale,	1 00
Oakham Farmer's Club, Oakham,	3 00
Grange, Petersham,	3 17
Weymouth High School, Weymouth,	1 00
Pomona Grange, Lowell,	2 00
Amesbury Board of Agriculture, Amesbury,	3 86
Pomona Grange, Methuen,	2 30
Hardwick Grange, Hardwick,	3 00
Middlesex North Agricultural Society, Westford,	2 56
Melrose Woman's Club,	3 15
Massachusetts Horticultural Society, Boston,	1 00
Walpole Grange, Walpole,	98
East Sandwich Grange, East Sandwich,	3 00
Middlesex Worcester Pomona Grange, Groton,	2 50
Worcester Horticultural Society, Worcester,	4 50
Field and Forest Club, Dorchester,	96
Whitman Board of Trade, Whitman,	2 95
North Dana Grange, North Dana,	3 92
Natural History Club, Bolton,	1 15
Springfield Botanical Society, Springfield,	6 50
New England Woman's Club, Boston,	1 00
Sloyd Manual Training School, Boston,	50
Newbury Grange, Newbury,	2 15
State Board of Agriculture, Worcester,	4 50

A list of the visits made, the area of woodland involved and the receipts for expenses are as follows:—

II. For Examinations of Woodlands.

OWNER OF WOODLAND.	Town.	Area of Woodland (Acres).	Expense.
J. R. Ayer,	Richmond,	100	— ¹
L. L. Baker,	East Templeton,	70	\$2 90
N. D. Bill,	Springfield,	400	20 00
Brockton & Plymouth Street Railroad,	Pembroke,	13	1 20
Miss C. Codman,	Dedham,	18	80
F. G. Crane,	Dalton,	1,600–2,000	19 70
M. H. Foskett,	Wilmington,	35	50
A. M. Goldsbury,	Warwick,	50	10 30
Rev. John Graham,	Warwick,	80	— ¹

¹ No expense.

II. For Examinations of Woodlands — Concluded.

OWNER OF WOODLAND.	Town.	Area of Woodland (Acres).	Expense.
Fiske & Field,	Weston,	100	\$0 50
A. S. Hayes,	Hopkinton,	130	1 30
Mrs. S. L. Hammond,	Carlisle,	52	50
Rev. N. S. Hoagland,	Warwick,	30	— ¹
Dr. R. Hogner,	Mansfield,	66	1 00
Rev. C. L. Hutchins,	Concord,	200-300	74
Graham D. Johnson,	Andover,	10	97
F. B. Knapp,	Duxbury,	30	1 50
Mass. State Hospital for Epileptics,	Palmer,	200-300	3 80
Miss A. McKim,	Warwick,	30	— ¹
Dr. H. W. Nelson,	Marshfield,	108	1 20
Pontoosuc Woolen Company,	Pittsfield,	143	8 70
Rev. F. H. Rudd,	Richmond,	30-40	50
Salem Fraternity,	Rowley,	15	1 20
H. W. Shepard,	Salisbury,	100	— ²
J. F. Spaulding,	Tewksbury,	25	50
Rev. E. Sturgis,	Andover,	28	1 80
R. B. Symington,	Chiltonville,	3,000	3 20
F. W. Wise,	Wellfleet,	1,200	14 65
Ellis G. Wood,	Sandwich,	100	— ²
Geo. M. Whipple,	Newburyport,	50	— ²
Ormstead Bros.,	The Fells,	—	— ²
Frost & Co.,	Arlington and Malden,	100	— ²
School for the Feeble-minded,	Waltham,	40	— ²
Morris Gray,	Cambridge,	10	— ²
Brockton Water Commission,	Brockton,	30	1 65
Miss Booth,	Springfield,	10	— ¹
Ames estate,	North Easton,	100	— ²

¹ No expense.² Paid by owner.

WHAT THE GENERAL COURT IS ASKED TO CONSIDER AT PRESENT.

I. Exemption from Taxation on Forest Land.

At present we have a law in our statutes (Revised Laws, chapter 12, section 6) that is ineffective, as it requires that 2,000 trees must be set on an acre of land to exempt it from taxation, while as a matter of fact 1,210 trees are all that are at present recommended for such purposes. The species of trees for planting are also too small, and the time for exemption I believe could well be extended to twenty years. In Wisconsin similar planting is exempt for thirty years. This law should be amended and modernized to meet our needs.

II. Forest Reserves.

It is time that some State forest reserve policy should be established in Massachusetts. The national government is doing much in this direction, and various States have State forest reserves. I would not recommend that this State go into an

elaborate system of reserves, but if the State Forester could be allowed an appropriation for purchasing cheap lands, and be permitted to replant them for demonstrative purposes, the object lesson would be valuable, and the State could not help profiting thereby financially. It is even possible that some towns or individuals would be willing to give lands to the State, provided they could be accepted and planted by the State Forester. One such offer was made during the year, and it is believed offers of land at low cost can be easily secured.

III. We must stop Forest Fires.

After traversing the State and studying conditions carefully, I feel that it will take some drastic mandatory laws in order to cope with the situation. Our people have been so indifferent toward forestry and the protection of forest property that we are absolutely wasting thousands upon thousands of dollars, not only for the present but the future, through sheer negligence. Even much of our so-called scrub growth would yield cord wood, if not lumber, were it not for fires which periodically run over these lands.

With the newly appointed forest warden system better results are expected; but why not clothe this officer with the power to arrest without a warrant any person or persons found in the act of unlawfully setting a fire or trespassing on forest property. This right is given the fish and game wardens; why not the forest wardens and their deputies?

We have a law in our statutes at present (Revised Laws, chapter 32, section 24) which reads as follows: —

In a town which accepts the provisions of this section or has accepted the corresponding provisions of earlier laws, no fire shall be set in the open air between the first day of April and the first day of October, unless by written permission of a forest warden. The forest warden shall cause public notice to be given of the provisions of this section, and shall enforce the same. Whoever violates the provisions of this section shall be punished by a fine of not more than one hundred dollars, to be divided equally between the complainant and the town, or by imprisonment for not more than one month, or by both such fine and imprisonment.

This law, it is believed, should not be left to the discretion of the towns, but should be enacted as a State law.

IV. The Forest Nursery should be enlarged.

If we had one million white pine seedlings at the State nursery to distribute at cost, I believe they would all be purchased and set out in Massachusetts this coming year. As a matter of fact, we shall not begin to be able to supply the demand, and already I have placed orders for spring delivery for two hundred and fifty thousand white pine seedlings for Massachusetts people. These seedlings can be raised for less than one-half our people are compelled to pay at the present time. As State Forester, I am very anxious to get just as many trees set on our waste and unproductive lands as possible; and, while nurserymen are adjusting their business to meet the growing demands for young trees, and are unable to supply them even at present high prices, it is well that we encourage our forestry interests by growing seedlings at cost. Were it not for the import duty, transplants (seedlings once transplanted) could be imported from Europe, and all charges paid, cheaper than we can purchase the seedlings themselves in this country.

It takes at least two years to grow white pine seedlings before they are ready to be set out permanently, and three or four years for transplants; hence, if we enlarge our nursery work now, it will be some time before the plants are ready for distribution.

Besides white pine, there are many other species of forest trees that should be propagated for dissemination.

I would recommend that the nursery work be increased to at least four times its present capacity. While the first cost would seem large, nevertheless, in from two to four years the money would be returned to the State from the sale of seedlings.

V. Increased Appropriation needed.

While the State Forester deplores the necessity for asking for increased appropriations for his work, he nevertheless feels that it is his duty to do so. While, as has already been shown, the money for both increased nursery work and forest reserves will be returned to the State ultimately, nevertheless, such appropriation must be made to begin with. Five thousand dollars could be used to advantage in enlarging the nursery, and for a system of forest reserves for which the first cost would be relatively large, it is recommended that an appropriation be made.

The regular appropriation for running expenses for the past year was at the rate of \$10,000 a year. This amount is asked for the present year.

Beginning with the spring town elections, according to the law passed last year, the new town forest warden law goes into effect. In order to establish the work as it should be, and encourage each town to do more thorough and definite work, a State appropriation of \$10,000 is recommended. Of this amount, \$2,000 is to be used for holding a convention as stated in the law, and the remainder used in paying forest wardens in various towns for actual service rendered in their respective towns in securing data and rendering services when called upon by the State Forester.

This recommendation applies equally to all towns of the State, as, if it were left to the towns themselves, many would very likely be indifferent; therefore, it is believed it becomes a matter for State legislation. All bills of forest wardens for services rendered at the request of the State Forester must be approved by that office; hence there is good assurance that the money will be strictly used for bettering forestry conditions everywhere in the State. The State Forester even hopes for example, to so educate his wardens that they may be on the lookout and report upon such insects as the gypsy moths should they invade new territory.

Only through forethought and system can we expect to accomplish in forestry what all our citizens would like to see.

SUMMARY OF RECOMMENDATIONS.

1. That the law relative to the exemption from taxation of lands set to forest trees be amended.
2. That a system of forest reserves for the State be established, and funds for their purchase and maintenance be created.
3. That the State Forester and his authorized employees and the forest wardens and their authorized deputies be given the same power of arresting persons found in the act of unlawfully setting a fire that the fish and game deputies now have.
4. That the law relative to permission to set fires in the open be amended, and made mandatory to the whole State.
5. That the appropriation for the State Forester's office be the same as last year, \$10,000, but that an additional \$15,000 be

made for the purpose of increasing the State nursery work, holding the convention of forest wardens, and recompensing these men for their assistance in the broader State forestry work as required under direction of the State Forester.

6. That the State Forester's annual report be made a public document.

Respectfully submitted,

F. W. RANE,
State Forester.

FIFTH ANNUAL REPORT OF THE
STATE FORESTER OF MASSACHUSETTS
FOR THE YEAR 1908

FRANK WM. RANE
STATE FORESTER



APPROVED BY THE STATE BOARD OF PUBLICATION

BOSTON
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Commonwealth of Massachusetts.

FIFTH ANNUAL REPORT OF THE STATE FORESTER.

To the General Court.

It is with continued pleasure that I submit this, the fifth annual report of the State Forester of this Commonwealth.

The office has increased in usefulness, and the work along all lines has been greatly enlarged. With forest products in constantly increasing demand, and thus all kinds of woods quickly finding a ready market, our people realize that right here in Massachusetts much of our cheap lands can be made more productive, and hence valuable in proportion to how well we care for them.

The forest warden act first went into effect last spring, and, although we have had but one season to test its efficiency, there can be no doubt but that this one natural channel of definite authority and usefulness will work wonders in establishing a successful State forest policy. These 343 forest wardens, one in each town and city with forested area, have already done valiant service, and when they are more experienced and are given public-spirited encouragement by our people throughout the State, they are bound to become great factors for good everywhere. With such an army of men enlisted to do service not only for their respective communities but in the aggregate for the State as a whole, results must come.

The work of making examinations and giving advice on forestry matters has grown even beyond our expectations. The correspondence has been very much larger, but more

readily handled, due to the available literature published last year and this.

The continued hearty co-operation and cordial assistance heretofore rendered to the State Forester have not been wanting this year. After due consideration and study of our forestry needs, some bills were presented before the last General Court which met with approval and were enacted. As on similar occasions heretofore, the forestry interests at the hearings before the Legislature were represented by all our forestry and agricultural organizations, and by public-spirited citizens. In fact, I do not believe I am over-stating conditions when I say that Massachusetts citizens generally are in accord in requesting you, the General Court, to enact as many laws as are necessary to regulate and establish a sane and practical system of forest management throughout this Commonwealth.

NEW LEGISLATION.

The new legislation enacted by the last General Court on forestry matters was as follows:—

I. Reforestation act.

II. Forest fire protection act.

III. Revised Law on exemption of reforested lands from taxation.

IV. A resolve authorizing the sale of certain publications of the State Forester.

I. REFORESTATION ACT.

The enactment of the bill on reforestation, introduced by Senator Treadway, marks the beginning of a practical demonstration of forest planting throughout the State. This work, it is believed, will prove not only of great economic importance, but be a great factor in practically demonstrating what can be actually accomplished. There is very little excuse henceforth for those of us who own run-out or cheap lands not to make use of them, as the State is ready to meet us more than half way.



THE FIRST GANG TO BEGIN PLANTING.—They are working under the reforestation law of Massachusetts, November, 1908, at South Ashburnham. Several hundred acres will be set next spring.

The bill is as follows:—

ACTS OF 1908, CHAPTER 478.

AN ACT TO PROVIDE FOR THE PURCHASE OF FOREST LAND AND FOR REFORESTATION.

Be it enacted, etc., as follows:

SECTION 1. For the purpose of experiment and illustration in forest management and for the purposes specified in section seven of this act, the sum of five thousand dollars may be expended in the year nineteen hundred and eight, and the sum of ten thousand dollars annually thereafter, by the state forester, with the advice and consent of the governor and council, in purchasing lands situated within the commonwealth and adapted to forest production. The price of such land shall not exceed in any instance five dollars per acre, nor shall more than forty acres be acquired in any one tract in any one year, except that a greater area may so be acquired if the land purchased directly affects a source or tributary of water supply in any city or town of the commonwealth. All lands acquired under the provisions of this act shall be conveyed to the commonwealth, and no lands shall be paid for nor shall any moneys be expended in improvements thereon until all instruments of conveyance and the title to be transferred thereby have been approved by the attorney-general and until such instruments have been executed and recorded.

SECTION 2. The owners of land purchased under this act, or their heirs and assigns, may repurchase the land from the commonwealth at any time within ten years after the purchase by the commonwealth, upon paying the price originally paid by the commonwealth, together with the amount expended in improvements and maintenance, with interest at the rate of four per cent per annum on the purchase price. The state forester, with the approval of the governor and council, may execute in behalf of the commonwealth such deeds of reconveyance as may be necessary under this section: *provided, however*, that there shall be included in such deeds a restriction requiring that trees cut from such property shall not be less than eight inches in diameter at the butt.

SECTION 3. The state forester may in his discretion, but subject to the approval of the deed and title by the attorney-general as provided in section one, accept on behalf of the commonwealth gifts of land to be held and managed for the purpose hereinbefore expressed. A donor of such land may reserve the right to buy back the land in accordance with the provisions of section two, but in the absence of a provision to that effect in his deed of gift he shall not have such right.

SECTION 4. Land acquired under the provisions of this act shall be under the control and management of the state forester, who may, subject to the approval of the governor and council, cut and sell trees, wood and other produce therefrom.

SECTION 5. All moneys received by or payable to the commonwealth or any one acting on its behalf under the provisions of this act shall be paid into the treasury of the commonwealth.

SECTION 6. Land acquired under the provisions of this act and subsequently reconveyed under the provisions of sections two or three shall not be exempt from taxation on account of any plantation of trees set out or planted while it was held by the commonwealth.

SECTION 7. For the purpose of assisting in reforestation a portion, not exceeding twenty per cent of the money authorized by this act to be expended may be used by the state forester for the distribution at not less than cost of seeds and seedlings to land owners who are citizens of the commonwealth, under such conditions and restrictions as the state forester, subject to the approval of the governor and council, may deem advisable.

SECTION 8. The state forester shall replant or otherwise manage all land acquired by the commonwealth and held by it under the provisions of this act, in such manner as will, in his judgment, produce the best forest growth both as to practical forestry results and protection of water supplies.

SECTION 9. All acts and parts of acts inconsistent herewith are hereby repealed.

SECTION 10. This act shall take effect upon its passage. [*Approved May 1, 1908.*]

As above indicated, this bill was approved May 1, 1908, and, as the planting season begins as soon as the frost leaves the ground in the spring, we were unable to make use of the appropriation until later in the year.

In order to bring the enactment to the attention of our people, and to make the first year's appropriation go as far as possible, the following general letter was sent out to all the chairmen of the boards of selectmen of our towns, newspapers, agricultural organizations, women's clubs, etc.:—

DEAR SIR:—The recent General Court enacted a law authorizing the State Forester, subject to the approval of the Governor and Council, to establish a system of forest reserves for promoting the forestry interests of the Commonwealth of Massachusetts (chapter 478, Acts of 1908).

The amount appropriated for this year is \$5,000, and succeeding years, \$10,000 annually.

In order to make the appropriation as useful as possible, I am addressing the chairman of the board of selectmen in each town, also all organizations and persons likely to be interested, asking if they have any lands they desire to turn over to the State for forest demonstration purposes. As many acres have already been offered to the State, provided the State Forester will accept and reforest them, and as it is believed that there are many more that would do likewise, I take this opportunity to bring the matter to your attention, and through you to your board, town and public interests.

Should your town authorities neglect to take advantage of this offer, you undoubtedly have some live, enthusiastic organizations, such as the grange, village improvement societies, farmers' and mechanics' clubs, etc., or even one or more public-spirited citizens, who would gladly donate cheap lands for the purpose. The donations for consideration are to be in the following classes: (1) land offered to the State free without restrictions; (2) land offered to the State free with restrictions.

As the work of reforestation thus done is to serve as an object lesson educationally, the State Forester desires in so far as possible to ultimately have these demonstrative forestry experiments in various representative sections of the State, locating them on frequently travelled roads, where they may do the most good.

Should you find an interest in your town to take this matter up, please advise me. It is desired that this work be gotten well in hand, so that all plans may be matured and the definite arrangements made where this work is to go forward.

Only a limited appropriation is available, and if you care to have your town do something, please take the matter up at an early date and confer with me.

It is believed much good is to come from this work, in promoting a better utilization of our waste and neglected lands, that should and will produce valuable forest products when properly husbanded.

When your application is received, it will be filed, and as soon as a date can be arranged, the State Forester or his authorized agent will meet with you or your committee and go over the land to complete arrangements for accepting and planting the same. First come, first served!

Very sincerely yours,

F. W. RANE,
State Forester.

STATE HOUSE, BOSTON, MASS.

The outcome of this agitation has resulted in the State's taking over by the end of the fiscal year, Nov. 30, 1908, 882 acres of land and purchasing about a million and a half of seedlings and transplants. We also planted about 25 acres to white pine at South Ashburnham this last fall.

The above work exhausted our first appropriation, and we are now prepared to begin the work of reforestation in earnest, as soon as the frost leaves the ground in the spring.

During this winter we are planning our next year's campaign, and already have many tracts of land in view in various sections. In order to take these lands over, besides an examination as to their suitability for reforesting, much time is necessary to make the necessary survey and transfer of the title to the State.

Of the 1,000 acres turned over to the State thus far, only 160 acres have been purchased, the remainder simply being deeded to the State at no expense. In nearly every instance the owners have inserted the repurchasing clause, so as to regain the property within ten years.

Lands acquired by the State.

Up to the present the State Forester has deeds in his possession from the following towns: —

TOWN.	Acres.	TOWN.	Acres.
Andover,	40	Oxford,	20
Ballardvale,	60	Rowley,	100
Barre,	50	Sandwich,	40
Belchertown,	10	South Ashburnham,	100
Carver,	5	Spencer,	75
Dunstable,	20	Templeton,	107
Erving,	40	Westford,	40
Gardner,	64	Westminster,	120
Hubbardston,	54	Winchendon,	50
Montague,	26		932

In this work of reforestation it is my plan to utilize the local forest wardens whenever practicable, of course under proper State supervision, and thus in time the State will have a corps of reforesting experts.

One hundred thousand Scotch pines have been shipped to Sandwich and heeled in this fall, for use in planting on the Cape next spring.



AN ABANDONED MASSACHUSETTS FIELD.—Nature is trying to reforest; man can assist, and quick results will follow.

Of course this work is but in its infancy, but it is believed that our people generally will appreciate this forward movement, and as soon as they realize the generous offer on behalf of the State they will be quick to accept the assistance offered.

With our depleted, neglected and waste lands reharnessed and made a live factor throughout Massachusetts, one of our natural resources will be headed in the right direction. In one town a prominent business man said that the agitation and taking over of lands by the State for reforestation have increased valuations of farming property fully 15 per cent already. If this is true, it must follow that when actual results are shown, the benefits are bound to be still greater.

II. FOREST FIRE PROTECTION.

This act is bound to accomplish good results. One of the greatest drawbacks to a stalwart progressive movement in forestry is the destruction and wanton waste caused by fires.

The time has come when the towns throughout the State must give a reasonable degree of assurance to their citizens that they are to be protected against losses by fire, if they expect people to invest time and money in reforestation and to build up a proper forest policy.

The following law was enacted in order to regulate and lessen forest fires everywhere. Here is an opportunity for the towns to clothe their forest wardens with power to accomplish results. If all our public-spirited people will give this law proper consideration, and accept the permit clause at the spring annual town elections this year, forest fires are bound to decrease. It is not the purpose of the law to take away personal liberties, but to conform the regulations for the benefit of the common good. Our towns throughout this State will be in the future what we make them. The following is the act:—

ACTS OF 1908, CHAPTER 209.

AN ACT TO PROVIDE FOR THE PROTECTION OF FOREST OR SPROUT LANDS FROM FIRE.

Be it enacted, etc., as follows:

SECTION 1. In a town which accepts the provisions of this act or has accepted a corresponding provision of earlier laws no fires shall

be set in the open air between the first day of April and the first day of December, except by the written permission of the forest warden: *provided*, that debris from fields, gardens and orchards, or leaves and brush from yards may be burned on ploughed fields by the owners thereof, their agents or lessees, but in every case such fire shall be at least two hundred feet distant from any forest or sprout lands, and shall be properly attended until it is extinguished. The forest warden shall cause public notice to be given of the provisions of this section, and shall enforce the same. Whoever violates the provisions of this section shall be punished by a fine of not more than one hundred dollars, or by imprisonment for not more than one month, or by both such fine and imprisonment.

SECTION 2. The provisions of the preceding section shall not apply to fires which may be set in accordance with regulations and methods approved by the superintendent for suppressing the gypsy and brown tail moths.

SECTION 3. The state forester shall notify every town in the commonwealth of the passage of this act by sending at least three printed copies thereof to the town clerk, who shall post the same in conspicuous places.

SECTION 4. The state forester and forest warden may arrest without a warrant any persons found in the act of setting a fire in violation of any provision of this act.

SECTION 5. The selectmen of every town shall cause this act to be submitted to the voters for their acceptance at the next annual meeting of the town after the passage of this act. The vote shall be taken by separate ballot, and shall be "Yes" or "No" in answer to the following question printed upon the ballot: "Shall an act passed by the general court in the year nineteen hundred and eight, entitled 'An Act to provide for the protection of forest or sprout lands from fire' be accepted by this town?" A majority vote of the legal voters present and voting at such meeting shall be required for the acceptance of this act; and upon such acceptance the provisions of section twenty-four of chapter thirty-two of the Revised Laws shall cease to apply to any town which has previously accepted that section. [*Approved March 14, 1908.*]

III. THE REVISED LAWS ON EXEMPTION OF REFORESTED LANDS FROM TAXATION.

The old law (R. L., c. 12, § 6) required that in order to get planted lands exempt from taxation at least 2,000 trees must be set to the acre. As 1,200 trees is the number commonly recommended, or 6 by 6 feet, this revision was necessary. The new revision also allows the filling out of naturally stocked lands, so that they may receive similar exemp-

tion. This ought to encourage some renewed efforts in that direction. The following is the act:—

ACTS OF 1908, CHAPTER 120.

AN ACT RELATIVE TO THE TAXATION OF PLANTATIONS OF CERTAIN VARIETIES OF TREES.

Be it enacted, etc., as follows:

Chapter twelve of the Revised Laws is hereby amended by striking out section six and inserting in place thereof the following:—
Section 6. Land upon which pines, chestnuts, larches, spruces, hemlocks, walnuts, hickories, American and large-toothed poplars, yellow and paper birches, beeches, maples, basswoods, or ash timber trees, or others when approved by the state forester, have been set out or planted to the number of not less than six hundred per acre, and which by such setting out or planting has become evenly stocked with such trees to the number of not less than twelve hundred per acre, including in such number the trees growing naturally upon said land, shall be exempt from taxation for a period of ten years after the said trees have grown in height two feet on the average, upon satisfactory proof by the owners to the assessors of the foregoing facts: *provided*, that at the time when the trees are planted or set out the said land is not woodland or sproutland, or land containing more than six hundred standing trees to the acre, and does not exceed in value ten dollars per acre; and *provided, further*, that such exemption shall not extend beyond the time during which said land is devoted exclusively to the growth of said trees. [Approved February 25, 1908.]

IV. AUTHORIZATION FOR THE SALE OF CERTAIN PUBLICATIONS OF THE STATE FORESTER.

Certain publications of this officer were so much in demand that to meet the same would be a financial burden, and as many of those desiring the publications expressed a willingness to pay for them if it were possible, the following resolve has been passed, enabling the State Forester to sell certain publications at cost, when sanctioned by the Governor and Council. The following is the resolve:—

ACTS OF 1908, CHAPTER 121.

RESOLVE TO AUTHORIZE THE SALE OF CERTAIN PUBLICATIONS OF THE STATE FORESTER.

Resolved, That such publications of the state forester as shall be designated by the governor and council may be sold by the state

forester at a price not less than the cost thereof; and additional copies may be printed for sale at the discretion of the governor and council, the expense thereof to be paid from the receipts from such sales. Any amounts received from such sales shall be paid into the treasury of the commonwealth. [*Approved June 1, 1908.*]

Many of the publications have been sent to other States since this resolve was passed. Upon its passage the following letter was sent to all applicants, and new editions have been printed:—

DEAR SIR OR MADAM:—Your application for either or both of the following forestry publications has been received:—

(1) “The Commercial Forest Trees of Massachusetts: how you may know Them. A Pocket Manual.” For general use.

(2) “The Study of Trees in Our Primary Schools.” For teachers, mothers, and all interested in teaching children to love trees and nature.

Under the Resolves of 1908 (chapter 121), the Governor and Council have designated that these publications be sold by the State Forester at a price not less than the cost thereof; and additional copies may be printed, the expense thereof to be paid from the receipt of such sales.

I am empowered to offer the above-named publications to you at the following prices:—

(1) The Pocket Manual, “The Commercial Forest Trees of Massachusetts: how you may know Them,” for 5 cents a copy at this office, or by mail for 2 cents extra.

(2) “The Study of Trees in Our Primary Schools,” for 12 cents, or by mail 8 cents extra.

In case a large number are wanted, as for schools, etc., they can be forwarded by express.

These publications are neatly gotten up, and, as they are in great demand (the first edition of 5,000 being exhausted in ten days), charging for them at cost is the only feasible method of dissemination.

I am sorry to have kept you waiting, but pleased to say I am able to supply you or your friends with as many as you may care for, as the new edition has just been received.

Very truly yours,

F. W. RANE,
State Forester.

STATE HOUSE, BOSTON, MASS.



MASSACHUSETTS FOREST LAND. — Reduced to desert conditions by repeated fires;
remedy, stop possibilities of fires and replant.

EXAMINATION OF WOODLANDS, AND PRACTICAL ASSISTANCE GIVEN OWNERS.

The policy of this office in giving assistance to owners of woodland in this State has been continued during the past year, with very satisfactory results. This assistance consists in an examination and report to the owner on the condition of his woodland or potential woodland, and advice looking to the treatment of the same. This advice, other than travelling expenses, is given free to the land owner.

The examinations made in 1908 number 64, outstripping the record of all previous years. The highest previous mark was 47 in 1906, while last year they numbered 37, — an increase of 67 per cent. The acreage is 15,842, — an increase of 86 per cent over that of last year.

Four of these examinations were what are called working plans; that is, the land was surveyed, and a forest map accompanied the report. The written outline included an estimate of the amount of standing timber, its value, the improvement work advised, its cost and the probable results. Two of these were made for private parties, one on a tract of 250 acres and one on a tract of 400 acres. The *chef-d'œuvre* of the year was a forest working plan for the city of Fall River, which covered the watershed of North Watuppa Pond, the city's water supply, — an area of more than 5,000 acres. The city owns 3,000 acres of this land. The fourth working plan is for the town of Westfield, and covers the watershed of their supply in Granville, some 6 square miles. Only the field work of this plan has so far been completed.

These working plans made on the watersheds are not alone useful to the communities for which they are made, showing them how they can handle the lands in their possession to the best advantage, but offer a basis for the study of the effect of forests on water flow. The working plan gives the character of the watershed, its area and the amount of forested and nonforested land. The controlling boards are usually in possession of figures which give the yield of the ponds and streams which constitute the supply. After a

number of watersheds of different character have been studied, some useful comparisons can be made from the accumulated data, and perhaps light thrown on a subject which has not been studied to the extent that one of such importance should be in this country.

A certain amount of "booming" was given to this phase of the work by sending out circular letters to the various State institutions, 15 in all; 5 of these took advantage of the offer and sought advice in regard to their woodland. Circular letters were also sent to the water supply authorities in the various cities and towns, and 5 have asked for examinations; other boards have asked for assistance.

Results of Assistance for 1907.

Blanks were sent to 25 people who received examinations last year, the object of which was to find out how far the recommendations made were carried out. Concerning the other 12 of the 37 the office was in possession of information which made the sending of blanks unnecessary. It was hoped also that this sign of interest in the work of last year would stir up those that have done nothing.

A summary of the results of this investigation is as follows: out of 37 examinations, 17 were recommended to thin, 20 to plant, 3 to do nothing, and 4 have no cards on file. Of those recommended to thin, 3 did all the work and 6 did part of it; this leaves 8 who have done nothing, or have not reported, which we imagine is much the same thing. On the planting side, 2 carried out all the work as advised, and 10 did something; the remaining 8 did nothing, or have not reported.

From the results of the work as reported for previous years, and from experience gained during the past year, we come to the following conclusions: —

1. That planting excites more interest and is more readily taken up than thinning.

2. That thinnings are increasingly important, as the work of fighting the gypsy moth becomes more widespread.

3. That thinning work is much more likely to be carried

out if the trees to be cut or left are marked by the visiting forester.

4. That elaborate working plans and maps, when made for private parties, result in nothing more being done than would come from an ordinary examination and report, and so should be abolished except in certain cases, when they should be made at the expense of the owner.

5. That, if this co-operative work increases during the present year at a rate approaching that of the last, it will be impossible for one man to accomplish it, so that another technical forester to help in this and other work will be a necessity in the office.

The New Application Blank for Examinations.

In order to simplify matters, and thereby get a larger number of our people owning woodlands acquainted with the willingness on the part of the State to assist them, the following new blank was printed and distributed very generously:—

No.....

Received.....

APPLICATION FOR AN EXAMINATION OF FOREST LANDS TO THE MASSACHUSETTS STATE FORESTER, STATE HOUSE, BOSTON.

The State Forester stands ready at all times to promote the perpetuation, extension and proper management of the forest lands of the Commonwealth, both public and private (1904, chapter 409, section 2).

If you have such lands, and desire an examination of them and advice as to their management, fill out the following blank form and send it to the above address of State Forester.

Upon receipt, this request will be placed on file, and you will be informed, in order of application, approximately when the examination can be made, and a mutual date can then be decided upon.

The only expense the applicant promises to pay is that of travel and subsistence of the State Forester or his assistants, incurred in making the examination.

It is always more satisfactory to personally meet on the property the owner or party most interested, at least when the preliminary examination is made. In this way a definite understanding can be had as to future undertakings, and whether working plans are necessary. Often a preliminary visit to gain knowledge of the problem and give advice on the grounds are all the services needed.

When sending this application in, a brief description of the land will assist us.

With the above understanding, I desire to have an examination made of a tract of land of approximately.....acres, located in the town of....., county of....., State of Massachusetts.

Signed.....

Address.....

Date....., 19 .

In order to emphasize the willingness on the part of the State Forester to co-operate with all State institutions in doing forestry work on any land that might belong to them, the following letter was addressed to the superintendents or officials, as the case might be, and a copy of the application enclosed: —

MY DEAR SIR: — I desire to call your attention to one of the duties of the State Forester, that is, the examination of lands belonging to any citizen or institution in the State, and the giving of professional advice in regard to its treatment for forestry purposes. There is no charge to the recipient of this advice except the necessary expense of travel and subsistence. This offer applies equally to land now under tree growth or unimproved land that should be.

A great many citizens have availed themselves of this offer, but very few institutions have made any applications for assistance under this law. It is more than probable that you know nothing of this opportunity, and it is for the purpose of acquainting you with it that this letter is sent.

Public institutions which have theoretically at least a permanent existence, are in a better position than private persons to carry on work which requires several years to show results. The State has established this office to bring about improvement of the present wooded area and the reforestation of unproductive land. It should lead the way by carrying out work on its own property.

If your institution has under its charge any wooded or unimproved land, I hope that you will make application to this office for a preliminary examination, after which, if the area is large and the work complex, a complete working plan can be made.

We are very busy at the present time, and cannot take up this work immediately, but if we have it in mind, will be in a position to take it up as rapidly as possible.

Very truly yours,

F. W. RANE,

State Forester.



THE SAWDUST PILE TELLS THE STORY. — This land should be immediately planted to white pine.

FOREST NURSERY.

The State forest nursery at Amherst on the farm of the Agricultural College was somewhat enlarged last spring, and, although it has been a very dry season and we had no facilities for watering the beds, they have come through in good shape. We have a stand of white pine, one-year-old seedlings, that is estimated will give over a million trees for future use. Smaller stands of other species of evergreens and deciduous trees are also growing here. This work is self-supporting, and in no instance have trees or seeds been given away.

As in the case of last year, particular pains were again taken this year to assist all persons having had planting examinations made, so that practical results would follow. In this way many plantations were made that otherwise would have remained unplanted.

It is believed that the State can well afford to do even more in nursery work. Commercial nurseries are asking higher prices, and as the demands are constantly increasing and we shall need larger supplies in the future, there can be no mistake in our growing enough to partly supply this demand. When commercial forest nurseries have been in existence long enough, so that we can depend upon getting stock at practical planting prices, we shall not need to do as much. There is a great difference in being able to save from \$1 to \$3 an acre in the first cost of planting, when seedlings are used. When transplants are used, the price is relatively higher.

The following orders were sent out last spring from Amherst: —

NAME.	Address.	Quantity of White Pine.	Quantity of Ash.	Amount.
Prof. J. Tyler, . . .	Amherst, . . .	1,000	-	\$4 00
John A. Cox, . . .	East Brewster, . .	1,000	-	4 00
Wm. W. Colton, . . .	Dalton, . . .	2,000	-	8 00
Overseers of the poor, . .	Palmer, . . .	1,000	-	4 00
N. D. Bill, . . .	Springfield, . . .	-	10,000	45 00
C. H. Thayer, . . .	Hadley, . . .	1,000	-	4 00
Paul C. Rockwood, . . .	Ashburnham, . . .	2,000	-	8 00
G. P. Morse, . . .	West Wareham, . .	1,000	-	4 00
G. W. Wheelwright, . . .	Wheelwright, . . .	5,000	-	20 00
C. L. Hutchins, . . .	Concord, . . .	5,000	-	20 00
C. A. Codman, . . .	Dedham, . . .	10,000	-	40 00
Mrs. L. P. Howe, . . .	Boston, . . .	1,000	-	4 00
Lawrence Minot, . . .	Wareham, . . .	4,000	-	16 00
G. W. Cook, . . .	Barre, . . .	3,000	-	12 00
G. D. Johnson, . . .	Andover, . . .	1,500	-	6 00
E. A. Bowen, . . .	Lakeville, . . .	5,000	-	20 00
Dr. J. E. Briggs, . . .	Segregansett, . . .	2,000	-	8 00
R. E. Allen, . . .	Shrewsbury, . . .	1,000	-	4 00
Kennan Damon, . . .	Concord, . . .	7,000	-	28 00
H. S. Cheney, . . .	Southbridge, . . .	5,000	-	20 00
A. G. Brockwalter, . . .	North Wilmington, .	1,000	250	5 00 .
H. M. Killam, . . .	Georgetown, . . .	1,000	-	4 00
E. C. Parker & Co., . . .	West Acton, . . .	5,000	-	20 00
L. C. Patterson, . . .	Webster, . . .	5,000	-	20 00
F. S. Clark, . . .	Pittsfield, . . .	200	200	1 65
A. F. White, . . .	East Freetown, . .	1,000	-	4 00
S. I. Bailey, . . .	Hanover, . . .	1,000	-	4 00
B. S. Blake, . . .	Auburndale, . . .	2,000	-	8 00
Taunton Water Works, . .	Taunton, . . .	4,000	-	16 00
P. R. Bradbury, . . .	Norwell, . . .	2,000	-	8 00
E. A. Hall, . . .	Cambridge, . . .	2,000	-	8 00
W. P. Bailey, . . .	Wareham, . . .	5,000	-	20 00
G. F. Kenney, . . .	Brimfield, . . .	1,000	500	6 25
E. P. Sherburne, . . .	Roxbury, . . .	- ¹	-	1 00
A. C. Spafford, . . .	Bradford, . . .	1,000	-	4 00
Lawrence Park, . . .	Groton, . . .	1,000	-	4 00
Sanborn G. Tenney, . . .	Williamstown, . .	1,000	-	4 00
E. P. Williams, . . .	Buckland, . . .	1,000	-	4 00

¹ School order.

NAME.	Address.	Quantity of White Pine.	Quantity of Ash.	Amount.
Baker Box Company, . . .	Worcester, . . .	1,000	—	\$4 00
E. E. Earl, . . .	West Boxford, . . .	1,000	—	4 00
S. D. Charles, . . .	Brooks, . . .	2,000	—	8 00
E. H. Blanchard, . . .	Lindenwood, . . .	1,000	333	6 00
E. G. Childs, . . .	Bondsville, . . .	3,000	1,000	16 50
P. F. Leland, . . .	Holliston, . . .	2,000	—	8 00
H. T. Brockway, . . .	South Hadley, . . .	500	—	2 50
S. E. White, . . .	Winchendon, . . .	1,000	—	4 00
Wm. A. Gaston, . . .	Barre, . . .	3,000	—	12 00
H. L. Frost, . . .	Arlington, . . .	—	3,000	13 50
A. R. Sharp, . . .	Taunton, . . .	—	3,000	13 50
H. L. Frost, . . .	Beverly, . . .	—	2,000	9 00
Park Hill Manufacturing Company.	Fitchburg, . . .	5,000	2,000	29 00
A. L. Hyde, . . .	Southbridge, . . .	800	200	4 50
C. R. Stacey, . . .	Taunton, . . .	— ¹	—	1 00
P. R. Allen, . . .	Walpole, . . .	—	500	2 25
E. A. Smith, . . .	Lowell, . . .	1,000	—	4 00
H. L. Frost & Co., . . .	Walpole, . . .	—	700	3 15
E. W. Breed, . . .	Clinton, . . .	—	2,500	11 25
B. S. Blake, . . .	Auburndale, . . .	1,000 ²	—	1 50
Total, . . .	. . .	115,000	26,183	\$578 55 ³

¹ School order.² Wild seedlings.³ This amount was turned over to the State Treasurer.

The following larger orders, for purchasers for whom examinations and recommendations for planting were made, were shipped direct from commercial nurseries: —

NAME.	Address.	Quantity.
Mt. Hermon School,	Mt. Hermon,	85,000
Nathan D. Bill,	Springfield,	20,000
Wm. G. Nickerson,	Dedham,	20,000
A. R. Sharp,	Taunton,	50,000
Everett Flood,	Palmer,	10,000
Brockton Water Works,	Brockton,	30,000
N. I. Bowditch,	South Framingham,	10,000
P. M. Low,	Baldwinville,	10,000
Total, . . . .	. . . .	235,000

White Pine Seed.

NAME.	Address.	Quantity (Pounds).	Amount.
G. W. Wiggin,	Boston,	1	\$2 00
N. D. Bill,	Springfield,	25	43 75
C. H. Bonney,	Boston,	3	6 00
O. C. Cook,	Milford,	1½	3 00
F. S. Clark,	Fitchburg,	¼	50
G. C. Tanski,	West Brookfield,	1	2 00
O. L. Howlett,	Southbridge,	1½	3 00
F. C. Hartwell,	Littleton,	1	2 00
E. S. Magoon,	Barre Plains,	1	2 00
F. M. West Company,	Springfield,	2	4 00
H. E. Hildreth,	Harvard,	2	3 50
O. H. Skinner,	Harvard,	½	1 00
G. E. Stone,	Amherst,	1	1 75
Total, . . . .	. . . .	40½	\$74 50 ¹

¹ This amount was turned over to the State Treasurer.

As stated in last year's report, it has been our purpose to see that all persons for whom examinations are made should be assisted directly in getting practical results. One way in which we served to accomplish this last spring was to furnish the seedlings at cost, and what we were unable to furnish from the State nursery were purchased and sent to them.

Nursery Stock on Hand in Fall of 1908.

VARIETY.	Age (Years).	Quantity.
White pine seedlings,	2	150,000
White pine seedlings,	1	1,200,000
Pitch pine seedlings,	1	40,000
Norway pine seedlings,	2	25,000
White ash seedlings,	1	20,000
Chestnut seedlings,	1	5,000
Black locust seedlings,	1	10,000
Honey locust seedlings,	1	12,000
Boxelder seedlings,	1	30,000
Horse chestnut seedlings,	1	100
		1,492,100
White pine transplants,	3	40,000
White ash transplants,	3	500
Catalpa speciosa transplants,	2	1,000
Maple transplants,	2	1,000
Oak transplants,	2	500
Total,		1,535,100

Seed on Hand in Fall of 1908.

	Pounds.		Pounds.
White pine,	175	Balsam fir,	2
Pitch pine,	5	White oak,	10 ¹
Red pine,	2	Chestnut,	25 ¹
Hemlock,	2	White ash,	10
Red spruce,	2	Black ash,	10
Norway spruce,	2	Rock maple,	30

¹ Bushels.

MUNICIPAL FORESTS.

One of the interesting features of the year was the spontaneous development of an important field of endeavor in forestry undertakings that has come in for a large share of the time of the State Forester's office.

Just at a time when we were planning and hoping for the establishment of more permanent forest reserves, Mayor Coughlin of Fall River, together with his water commissioner and city engineer, called at the office in an official capacity to determine if the State could assist them in converting their water basin about Watuppa Pond into a forest, the suggestion having come to the water commissioner when reading an article which appeared in one of the Boston Sunday papers, on the State Forester's work. The results of this meeting were that the State Forester and his assistant spent a day with the Fall River city officials, made a preliminary report, which was accepted, and then a working plan of the whole watershed, which covers an area of over 3,000 acres, exclusive of the reservoir itself. This work will appear as a publication from this office later in the year.

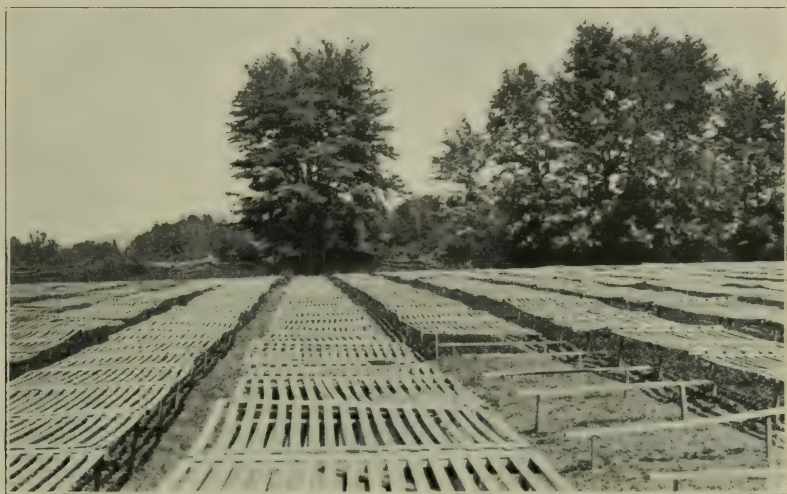
Upon learning of the work at Fall River the town of Westfield applied for a similar examination and plans for its watershed. This report is in progress at the present time.

Seeing that the work would be of equal interest to many other cities and towns, the State Forester wrote all such, with the result that at the present time we have applications on hand for several more, and this department of the office can see plenty of work ahead of it for some time. It may be said that the cities in each instance have been ready to turn over to the State, for its assistance, the help of its engineers and assistants, so that the expense to the State remains relatively low for this work.

The beauty of this work is that, from whatever standpoint one cares to look at it, it is found to be a great benefit. Practically or economically, æsthetically or from the sanitation standpoint, the city is bound to derive great future benefit.

PUBLIC LECTURES AND ADDRESSES.

The State Forester has done all this kind of work he possibly could, and keep up with the routine work necessary under the present organization. During the winter months one's whole time could be utilized largely in lecture work on forestry, the demands are so great. As heretofore, the policy has been to accept invitations to address public meetings



STATE FOREST NURSERY AT AMHERST. — Over 1,000,000 white pine seedlings at end of first year.

whenever it can be shown that good results are likely to follow. In accepting invitations, the request is made that an audience of at least 100 be guaranteed, if possible.

LECTURES BEFORE BUSINESS MEN'S ORGANIZATIONS.

One of the pleasing features of the year was the great interest manifested in forestry by our various boards of trade, merchants' associations, lumbermen's organizations, etc. The State Forester delivered talks on forestry before such organizations in the cities and towns of Fitchburg, Pittsfield, North Adams, Springfield, Winchendon, Bridgewater, Upton, Clinton, and several in Boston, as the Massachusetts Reform and Economic clubs, Lumbermen's and Market Gardeners' associations. Results of these meetings have been very apparent in the great amount of inquiries and requests that have come to the office from this source. It takes business men to do things, and to these organizations the State Forester looks for very much assistance in the future.

LECTURES OUTSIDE THE STATE.

The State Forester has been called upon to address various organizations during the year outside the State, some of which were: the Society for the Protection of New Hampshire Forests, at Intervale, N. H.; the Citizens of St. Johnsbury, Vt.; the Society for the Promotion of Agricultural Science, at Washington, D. C.; the American Forestry Association, Washington, D. C.; and the University of Maine, at Orono, Me.

THE NATIONAL AND STATE CONSERVATION COMMISSIONS.

The State Forester was chairman of the State delegation appointed by Governor Guild to attend the Conference of Governors, called together by President Roosevelt last May. Later the same committee of three was appointed as the State Conservation Commission, to assist the National Conservation Commission in getting together data relative to the natural resources of the nation. Of course the office of the Massachusetts commission was in collecting Massachusetts data only. This same State commission, headed by Governor

Guild, attended the second meeting of the National Conservation Commission in Washington, D. C., during the week of December 8.

THE NATIONAL IRRIGATION AND FORESTRY CONGRESS.

The State Forester was invited to address the above congress at Albuquerque, N. M., September 29 to October 4, on "Municipal Corporation and Private Ownership Forestry Development."

This congress was as usual a very representative occasion, and offered a splendid opportunity to meet men who are doing things. To the acquaintances made at this meeting and that of last year at Sacramento, Cal., are due the interest and courteous treatment given us by western men at the recent hearing before the agricultural committee of Congress at Washington, D. C., the fore part of this month, at which Governor Guild presided. Governor Chamberlain of Oregon, Ex-Governor Pardee of California and President-elect Barstow of the National Irrigation and Forestry Congress, who were in attendance at the Conference on the Conservation of Natural Resources at the time, all prominent in said Irrigation and Forestry Congress, gladly appeared and endorsed our movement for the White Mountain and Southern Appalachian forest reserves.

As alluded to last year, the more one sees of the more arid sections of the west, the better satisfied he is with the future possibilities of New England forestry.

MEETING WITH THE STATE FIREMEN'S ASSOCIATIONS.

One of the pleasing occurrences of the year was the opportunity offered through an invitation of the State Firemen's Association to address that body on "Forest Fires and their Prevention," at their annual meeting which convened at Nantucket on September 9 and 10. Not only was the State Forester well received and given an exceptional opportunity to get acquainted with the men who have in charge the great responsibilities of protecting our homes in our cities and towns, but he was able to discuss with these men the impor-

tance of also systematizing and working out similar methods for handling forest fires.

Since attending this meeting and making the acquaintance of so many good men, a great many valuable suggestions and assistance have come to the office; and there is little doubt but that as time goes on very valuable assistance is bound to come from the chiefs of fire departments in regulating and organizing forest-fire fighting methods for effective results.

Our forest wardens and the chiefs of fire departments and their deputies should by all means work together in harmony. Already in many instances both offices are held by one man. Where the offices are separate, a definite understanding and methods of co-operation should be entered into. Both are public servants, and should be public spirited and work together for the benefit of all.

PINE TREE BLIGHT.

There probably have been few subjects that have caused more alarm than the so-called pine tree blight, which was so prevalent last year, and is still in evidence, although to a far less degree, this season. As was predicted in last year's report, the trouble was not as prevalent this year, especially in sections where it was very bad last year, as at Winchendon. However, at Greenfield it was worse, if anything. On the whole, for the State, while trees affected last year still showed the effects, and an experienced person could pick them out at a distance, nevertheless they have improved in condition, and many will undoubtedly outgrow this malady.

In order to keep in close touch with the pine tree blight, so that, should it develop still further this season, we might possibly obtain further information for combating it, besides having the assistants and others on the alert for developments, a young man, Mr. Thomas Jones, a recent graduate of the Massachusetts Agricultural College, who had specialized in mycology, was employed for a month. Nothing particularly new was found, other than was reported in the annual report last year.

Early in the season most of the tip growth of the new shoots seemed to be affected, and it was thought that some

young plantations of trees from three to six feet high at Winchendon were more troubled than last year; but a month later it was found that the browning or dying did not extend beyond the first stage, and when the needles were fully out the general appearance was little else than normal.

Undoubtedly more or less white pine trees will be affected from year to year with this trouble; but it is believed that we need to pay little attention to it, other than when a tree is badly affected and is going to die, it should be cut and utilized. The greatest loss comes where pine trees are valued from the æsthetic or landscape-gardening standpoint; and these are not as likely to be troubled, as the chances are they are on better soils, and hence likely to withstand such depredations.

FOREST FIRES.

The past season has been a noted one throughout the country for disastrous forest fires. The extremely dry season rendered conditions exceptionally favorable for fires throughout the whole summer season. Exceptionally heavy forest fire losses were reported constantly from all the New England States, New York, Canada and the Lake States.

This is the first year Massachusetts has ever had a definite system whereby reliable data on forest fires have been collected. We are not in a position, therefore, to compare this year's data with those of previous seasons, other than in a general way. The State Forester takes pride, however, in reporting that it is his belief that Massachusetts has suffered relatively less than other States, considering her dense population and previous experiences. When Maine and the Adirondacks and other New England States were having their worst fires, Massachusetts was comparatively free.

It is believed that our new forest warden system saved to the State this year alone far more than people begin to realize. The State Forester has kept one man busy throughout the year, simply attending to the new forest fire regulations and assisting the forest wardens.

During the first part of the season forest warden badges were decided upon, which are numbered consecutively from 1 to 350, and sent out to all wardens. This has assisted,



PORTION OF STATE FOREST NURSERY AT AMHERST. — Showing transplant beds.

in that it gives the warden his proper credentials. The number of each badge is kept on file in this office, and thereby any forest warden can be identified. The badges are the property of the State Forester, and held by the wardens only during their services as such.

As alluded to elsewhere, warning forest-fire notices, made of cloth, were supplied to all wardens in large numbers; and they and their deputies took great pains in seeing that these were posted generally throughout the towns, and particularly where there was slash remaining from cut-over lands, etc.

During the very smoky times this office was repeatedly informed from the various wardens that they were exerting themselves and keeping close watch, and even patrolling the towns to minimize the great chances for fire outbreaks. No one could expect a greater loyalty and interest than these newly appointed forest wardens and their deputies have shown, and the State Forester desires here to publicly acknowledge their true worth and fidelity to the State.

It is proposed to publish the data collected on forest fires for the State in a bulletin by itself, a little later on. The following table will be of interest, in showing to what extent and number and of how great damage these fires have been during the year. It may be said also that these fire estimates may be considered extremely conservative. Can any one doubt the needed rational legislation for handling such a parasite upon our veritable future prosperity?

[illegible]

FOREST FIRE POSTERS.

Following the instructions in the statutes, as last year, the State Forester had the abbreviated instructions of the forest fire laws printed on a large paper poster in red and black ink, 18 by 27 inches in size, and distributed them to all railroad stations, post-offices, chairmen of the boards of selectmen and forest wardens. For general use a new, smaller and more practical cloth poster was sent out in large quantities to all forest wardens for use throughout the State. This poster has served its purpose well, and good reports come from every section, which shows our people are taking an interest in stopping forest fires. (See below.)

WARNING!

FOREST FIRES

EXTRACTS FROM MASSACHUSETTS FOREST LAWS.

Setting Fire to Growing Wood or Timber of Another. Punishable by a fine of not more than \$100.00 or by imprisonment for not more than six months. R. L. 208, Sec. 7

2. **Letting Fire Escape.** Negligently allowing fire to escape from your own land to adjoining land. Punishable by a fine of not more than \$250.00, also liable for damages. R. L. 208, Secs. 8 and 9.
3. **Forest Wardens Not Liable to Arrest for Trespass.** Wardens, Deputies and Assistants, not liable for trespass while acting in the reasonable performance of their duties. Acts 1907, 475, Sec. 6.
4. **Permit to Light Fire in the Open.** In Towns so voting. A permit from the Forest Warden must be obtained to start a fire between April 1 and December 1. The only exception being—that debris from fields, gardens and orchards, or leaves and brush from yards may be burned on ploughed fields by the owners thereof, their agents or lessees, but in every case such fire shall be at least two hundred feet distant from any forest or sprout lands, and shall be properly attended until extinguished. Violation of this provision—Punishable by a fine of not more than \$100.00 or imprisonment for not more than one month or by both such fine and imprisonment. Acts 1908, 209, Sec. 1.
5. **Arrest without Warrant.** The forest warden may arrest any persons found in the act of setting a fire in violation of the provisions of this act. Acts 1908, 209, Sec. 4.
6. **Penalty for Refusing Aid.** Any person between the ages of 16 and 50 years who refuses, without good cause, to assist the Forest Warden or his deputies in the fighting of forest fires is liable to a fine of not less than 5 or more than 100 dollars. R. L. 32, Sec. 21; 1907, 475, Sec. 3
7. **Disturbing Notices.** Whoever wilfully tears down or destroys any notice posted under the provisions of this act shall be punished by a fine of \$10.00. Act 1907, 475, Sec. 7.

FOREST MENSURATION OF THE WHITE PINE IN MASSACHUSETTS.

The above was the title of a publication of this office sent out during the year. The purpose of the publication was set forth in its preface, "Reasons for Publication," as follows: —

This handbook is published by the State Forester that our people in Massachusetts may have at their disposal information as to how they may determine, by simple measurements and the use of tables, the yields, and hence the values, of pine trees, from the commercial or lumberman's standpoint.

The time has come when we should have a better practical working knowledge of forest values. Forest products continue to become more valuable yearly. It is believed that business men and all persons at all interested in forestry matters, as well as lumbermen and farmers, can get much that is of value from the tables and general information contained in this handbook. There is no reason why a person owning white pine growth, whether a small or a large tract, should not be able to determine practically how much lumber it is capable of producing, and hence its value, even before the trees are cut, if he cares to do so. This handbook will assist him in doing this very thing.

Trees are easy of access, and can be estimated with great accuracy. The old idea, that a man must spend a lifetime as an estimator or cruiser in order to determine accurate yields from tree growth, is rapidly passing. The time of guesswork is being replaced by more definite knowledge.

In order to secure the data contained in the tables, the State Forester has had measurements of white pine taken in all parts of Massachusetts by trained men, and the data have been submitted to practical experts as well, so we feel the work is authoritative.

This publication has been well received and apparently much appreciated.

GOOD ROADS A BENEFIT TO MODERN FORESTRY.

The forward movement and excellent work being carried out in road construction throughout Massachusetts are bound to result in bringing about modern forestry management in many back rural towns, more quickly than many people realize. The farther the forests are from the railroad or mar-

ket, the greater the expense made necessary in operating them. If to disadvantage in distance poor roads be added, it is readily seen that the transportation question alone precludes practising modern forestry. The fact that two to three times as large loads can be drawn on good roads as on poor ones, and in many instances more trips can be made in the same length of time, will convince any practical lumberman or business man of the importance of good highways.

The State Forester is under many obligations to the State Highway Commission for courtesies extended during the year to study the State forestry conditions, by being invited to accompany said commission on their inspection tours, which were made by automobiles.

THE TENTH ANNIVERSARY OF THE BILTMORE FORESTRY SCHOOL.

The State Forester was the Massachusetts delegate appointed by Governor Guild to attend the tenth anniversary of the Biltmore Forestry School.

This occasion, which occurred at Biltmore, N. C., November 26, 27 and 28, on the estate of George W. Vanderbilt proved a most instructive and valuable one. As the "American Lumberman" expressed it, "An Extraordinary Outing of Representatives of all concerned with Timber, from the Tree to the Trade." The three days were extremely well planned by Dr. C. A. Schenck, the head of the Forestry School, for getting just the information desired. There were representative men present from every phase of forestry interests and from all over the country, including Canada.

It was an excellent opportunity to see just what can be accomplished in forestry in a comparatively short time, and also to have pointed out and discussed wherein failures have been made.

This occasion marked a new epoch in American forestry, and, without giving further details about the gathering, suffice it to say that the anniversary proved extremely instructive and valuable, from a great many standpoints. The State Forester felt well repaid for the trip.

CO-OPERATION WITH THE UNITED STATES FOREST SERVICE AND FORESTRY OFFICIALS OF OTHER STATES.

The State Forester wishes here to acknowledge the hearty co-operation that Mr. Gifford Pinchot and his able assistants and forestry officials of the various States have rendered whenever called upon. At the present time co-operative work with the division on forest products of the forest service is going forward, which we believe will prove of great value when finished. This will require some little time yet. It has been a pleasure to be of assistance to the many forest service men who have been compiling data of various sorts for the National Conservation Commission reports throughout the season. The State Forester welcomes all interested in forestry.

ARTICLES FOR PAPERS ON GENERAL FORESTRY INFORMATION.

During the year there were calls upon the State Forester for some general literature for use in interesting owners of woodland in a few sections. This call came first from an enterprising newspaper man and a lumberman at Greenfield. Thinking the information would be of equal use to all rural sections, articles were prepared from time to time and sent to all papers that could use them to advantage. These articles were used quite generally, and we believe have been of assistance to many. Four of the articles sent out were as follows:—

HOW MAY THE FARMER ASSIST IN THE REFORESTATION OF NEW ENGLAND.

Forestry, when managed properly, will utilize our millions of acres of land in New England, at present seen on all too many farms scattered in every section, known as waste land, abandoned pastures, sprout lands, barrens, plains, etc., returning them to forest culture.

If modern agriculture has taught us farmers anything, it is that concentration of effort, better culture and modern rotations are what make profitable farms. If an inventory is taken of the average New England farm, it will be found that there are many acres capable of yielding more profit to the farmer if devoted to the forest or

tree crop than used for any other purpose. These acres should therefore be converted to forestry as rapidly as possible. If each farmer will act accordingly, it may be only a matter of a comparatively short time when New England would be blessed with well-balanced rural conditions. The State Forester, agricultural colleges and forestry schools of various New England States are ever ready to assist and advise in forestry work.

The same culture that will return saw logs to our mills, make work for our country folk in winter, replenish our town treasuries, repaint the old red schoolhouse, pay the sexton to again ring the country church bell, make better roads, and, in short, return the former substantial livelihood of country life, will also conserve moisture, protect and enrich the soil, give an equitable climate, and return to New England the natural beauty we all would love so much to see.

This is a seed year for the white pine in Massachusetts, and it may be elsewhere. Let each farmer collect some cones before they open, which is very shortly, then extract the seeds and plant them next spring in a bed in the garden. In two years' time he will have enough seedlings, if they are properly cared for, to set out many acres. We must learn to plant and care for our forest lands in the same way we do our better tillable soils, and they then will bring proportional yields of profit. The beauty of the whole forestry problem of New England is that in its practical solution it not only results in economic forestry, but solves the æsthetic side as well. It is entirely wrong to think that trees should never be cut. Lumbering is as important to successful forestry as is the digging of potatoes or the harvesting of any crop when it is ripe. The same essentials of culture, also, must be understood in getting maximum returns in the one case as in the other.

F. W. RANE,

Massachusetts State Forester.

HOW TO COLLECT AND USE WHITE PINE SEED.

White pine seeds sell at \$4.50 retail, \$2 in large lots, in Boston this summer, and the seeds of some other evergreen trees are still higher. Every owner of woodland with matured pines is in a position to take advantage of these almost fabulous prices, for the time has arrived when the pine cones should be picked. The white pine cones containing the seeds are ripe, and should be picked at once. This dry weather will open the cones before many days, and the seeds will drop out and scatter to the four winds, almost a total loss, while prudent lumbermen all over the country are paying high prices for seeds picked elsewhere. The market has to be supplied; it fixes a price that will produce the goods. If the seeds cannot be obtained at \$4.50 per pound, they will go higher, until the farmers go into the business of seed picking or give away their prospects to

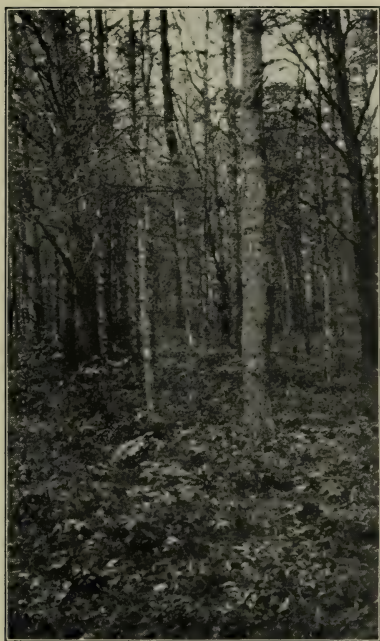
commercial pickers. Moreover, the revival of interest in forestry is so marked in Massachusetts this year that it points to reforestation on a broad scale in the near future, and this will be attended by an increasing demand for the white pine seed. Tree owners who are alive to their prospects will prepare for this demand by saving this year's crop, since the white pine seed will retain its vitality for several years, if given normal conditions, — not too moist or excessively dry.

There is no time to lose this year, nor time to make elaborate preparation for systematic picking. Collect the seeds somehow, by the means that first suggest themselves, and the market will turn them into cash. One way is to run a long ladder up the tree; another is to go into the sections where lumbering is going on, and collect the cones as the trees are felled. Boys may climb up with small bags thrown over their shoulders and pick from the large branches without difficulty, about the same as apples are picked. After the cones are gathered, they may be dried where squirrels and mice are kept from them, and then thrashed until the seeds fall out. The practice of using a bag to put cones in is convenient, as they may be flailed in the bag during spare moments, and the seeds fall out where they are readily separated from the waste.

To turn this waste crop into ready cash is not the only inducement in store for the land owner. It makes reforestation so comparatively inexpensive, producing the seed at the cost of cheap labor, instead of at \$4.50 per pound, that there no longer will then be good reason for allowing waste land to remain idle and non-productive. Under its new policy the State of Massachusetts gives direct aid and counsel to any land owner who desires to seed his waste land. Communication on this subject may be established with the Massachusetts State Forester, Prof. F. W. Rane, State House, Boston, and he will be pleased to meet the farmers and to give practical advice. He says that of the vast amount of lumber used in Massachusetts probably 95 per cent. is imported from other New England States, from the west and from the south. Massachusetts certainly is capable of growing more than 5 per cent. of the lumber it uses; in fact, it is destined to become a lumber State that will closely approximate its consumption with its production, and the production of a seed crop at reasonable cost is the first important step in this movement.

AN OPPORTUNITY TO REFOREST WASTE LANDS.

Reforestation is so vital to Massachusetts and to her country population that it will be placed on a systematic basis in the near future. Preparations are now being made, under authority of an act of the Legislature of 1908, appropriating \$5,000 for this year and \$10,000 annually thereafter. With this money the State proposes to buy and reforest idle land, and has already addressed itself on the subject



A PINE STAND AT PLYMOUTH MARKED
FOR THINNING.



THE SAME STAND AFTER THINNING.

to the selectmen and land owners throughout the Commonwealth, with most promising results.

The proposition is arousing attention everywhere. Hundreds of acres of waste land have been offered to the State at nominal cost, a considerable portion of it being offered as a free gift. Such overtures have come from West Brookfield, Spencer, North Ashburnham, Hubbardston, West Tisbury, Westford, Sharon, Gardner, Oxford, Winchendon and Sandwich. A business concern has pledged itself to donate 100 acres of land in southern Massachusetts, and an individual in Hampshire County has come forward voluntarily with an offer of 300 acres. This movement among land owners to turn over their idle property to the State, brisk at its very inception, substantiates the general supposition that there is in Massachusetts a vast acreage of land that has become unprofitable through indiscriminate and unbusinesslike lumbering. It shows, further, that the owners of this property have lacked the incentive, or the means, or the inducement, to tie up their capital on soil where the returns are so remote. Now comes their opportunity to let public capital develop their land and restore it to a paying condition on better terms than private effort could do; and many of them are quick to see that this is a wise policy, even if it takes away conditionally their title to the property. On these terms the State is getting a wide choice of land, and when it has registered enough to permit of proper selection, the actual work will begin. There seems to be no doubt now about the ability of the forest department to get all the land it can handle.

While the deed in these transactions passes the land over to the State, it provides that the original owner may repurchase within a stipulated period, at the price he received plus the money spent on improvement and 4 per cent. interest. In all probability the replanting can be done by the State at less cost than by private effort, because the State has the work reduced to a science, and a corps of trained men to execute it. Not only are individuals accepting this proposition, but townships have taken it under consideration, with a view to turning over to the State sections of poor farms and watersheds for the planting of trees.

Both in accepting free and in buying land, the State will give preference to tracts situated along highways, where the new plantation may serve the dual purpose of restoring the lumber stock and demonstrating to the public how the work should be done.

THE COLLECTION AND USE OF OTHER FOREST TREE SEEDS THAN WHITE PINE.

Now is the time to collect certain forest tree seeds. One crop of the forest is gone, — the white pine, — and another is ready for the harvest. In years gone by the pine seed has been wasted in Massachusetts; it was wasted this year, too, but it attracted more attention

than in the past, and the reports from various parts of the State show that more was collected than is usual. For instance, a man in Winchendon has collected 100 pounds of clean seeds this fall, employing boys to pick the cones for him, and he netted at least \$100 on the job. Massachusetts could be made to supply its own seed for reforestation, and it is squandering a valuable product so long as it does not. The rebuilding of our forests is of such vast importance that it is the first subject to be taken up at the conference of New England Governors soon to be held in Boston. Land owners have an excellent opportunity this fall to provide themselves with the seeds of hardwood trees, such as the white ash, the rock maple, the hickory, the chestnut and the beech tree. The picking should begin at once, and it should be completed before the second week in November.

On the white ash, for example, the leaves have fallen off and the seed remains on the tree; they are about two inches long, and are provided with wings, hence are easily seen and reached. A medium-sized tree, about as large as an ordinary apple tree, may yield about 20 pounds of seed, retailing at about \$1 per pound. Almost any other crop of equal value would be taken care of, but this one, as a rule, is allowed to go to the winds. It can be harvested into a bag without much difficulty, either by shinning the tree or raising a ladder. There is a good demand for white ash. The seed of the rock maple has about the same commercial value; it is easier to gather, because the limbs on the tree hang low, and it will remain on the tree two or three weeks longer. How to keep the seeds of the white ash and the rock maple over winter is a problem that requires some attention, but it is not difficult. It is only necessary to dig a hole in the ground some feet deep and sink a box into it; in the bottom of the box put a layer of sand, and then spread a layer of seed 5 inches thick; cover this with 2 to 3 inches of coarse sand, and repeat the layers until the box is filled or the supply exhausted. Then cover the box about 1 foot deep, to prevent the contents from freezing, and the stock will keep until next April, when it should be taken up. Kept thus during the winter it is ready for planting in the spring, and should be set half an inch deep in rows about 1 foot apart. In one year the plants will be large enough to transplant to the forest where they are to remain.

The first substantial frost will open the burrs on the white oak, the chestnut, the hickory and the beech, and the seeds will drop to the ground, where they can be picked without any difficulty. The acorn is worth about \$2 a bushel, the chestnut 15 cents a quart and the hickory nut \$3 per bushel. They are layered for the winter in the same way as the white ash and rock maple, and in case of only a small quantity the most serviceable method is to sink a 2-foot tile into the ground and fill it with layers of sand and nuts, stretching a

wire netting over the top, to keep the squirrels out. The pitch pine and Norway pine cones will open almost any time, and should be picked at once, before they open, if this year's crop is saved. The Massachusetts State Forester is aiding in every possible way to accomplish results; let us all do our part.

The following very complete and valuable work accomplished by the Metropolitan Water and Sewerage Board in practical forest planting is published in this, the State Forester's report, by permission of said Board, in order that the data may be put into the hands of our people, who will find it of great value in demonstrating definite results: —

FORESTRY WORK IN CONNECTION WITH THE CONSTRUCTION OF THE WACHUSETT RESERVOIR.

In order to treat comprehensively the work as it has been carried on, it will be found advantageous to divide the subject into five branches, namely: general; nurseries; plantings; improvement thinnings; fire protection.

General.

The work of reforestation was begun in 1898 by the preparation of two nurseries for the raising from seeds of both coniferous and deciduous seedlings, to be planted on such of the lands owned by this Board as were not already covered with a timber stand of some description.

The first field planting was made in the spring of 1902, when about 175 acres were planted, and since that time plantings varying in size from 50 to 200 acres have been made every spring and fall.

The results obtained have been exceptionally satisfactory as far as the conifers are concerned, there being approximately 90 per cent. of the seedlings planted which have lived.

The deciduous seedlings raised in the nursery have in almost every case failed completely after being transplanted into the field. This failure was probably due to the character of the soil in the nursery.

Altogether, there have been planted about 1,330 acres with about 1,850,000 trees, made up of 948,000 conifers and 902,000 hardwoods, of which about 90 per cent., or 853,000 conifers, and 7 per cent., or 63,000 hardwoods, are living at present.

Nurseries.

There are two nurseries, one on either shore of the reservoir, having an aggregate area of 8 acres.

The one on the north shore, containing 4.3 acres, is used for hardwood or deciduous seedlings, and was originally arable or grass land,

so that no great amount of preparation was necessary to make this area suitable for nursery purposes.

The one on the south shore, containing 3.7 acres, is used for the raising of coniferous seedlings. This area was originally covered with a white oak and chestnut stand about fifteen years old, so that a large amount of work, consisting of clearing, grubbing, plowing and harrowing was necessary to prepare the area for nursery uses. This work cost about \$200 per acre.

The nursery work, which consists of preparing the ground, sowing the seed, caring for the seedlings by watering, mulching, screening and weeding the first year, and transplanting, watering, screening and weeding the second and third years, costs \$1.50 per 1,000 trees for the first year and \$1.60 per 1,000 trees for each succeeding year.

Plantings.

The seedlings, having been at least two seasons in transplant rows, are now ready for their final planting into the field. Planting gangs composed of from 25 to 30 men are employed on this work, 4 or 5 of whom are engaged in the nurseries preparing the trees for the field, which work involves taking the trees from the transplant beds, pruning the roots, sorting, counting, puddling and transferring to the field, while the remainder are engaged in the actual planting process. The maximum rate of planting acquired by an experienced gang under ideal conditions was 1,000 trees per man per nine-hour day.

Spring plantings are made immediately after the frost leaves the ground, and fall plantings before it enters.

Previous to the fall planting of 1906 the general type of planting was white pines, spaced 10 by 10 feet, with some hardwood filler, making the trees 5 feet apart each way. The above-mentioned type was abandoned in 1906 because of the almost complete failure of the hardwoods, and solid white pine stands, the trees spaced 6 by 6 feet, have been planted since that time.

In order to have an effectual screen along the forested portions of the shore of the reservoir, which would prevent the foliage from the deciduous trees from being blown into the reservoir, three rows of white pines, spaced 6 feet apart each way, and two rows of arbor vitæ, 2 feet apart, trees 3 feet apart in the rows, have been planted on the back half of the 50-foot reservoir margin. The greater proportion of the arbor vitæ have failed, probably because of having been planted in the field when too young (two or three years old) to endure the severe exposure which prevails along the shores of the reservoir.

Improvement Thinnings.

Under ideal conditions the trees require no care after having been planted in the field; but experience has shown that in pasture or brush land, where the common gray birch grows naturally, and in

sprout or scrub land which has been underplanted, it is necessary to thin out and trim up the hardwoods in order to prevent too much shade and the destructive thrashing of the tops of the pines. This process, termed "improvement thinning among planted trees," costs about \$6 per acre.

In the original timber stands the policy has been to take out the mature, undesirable or weak trees, thereby improving the stand by giving more space and air to the strong, hardy specimens. This class of work costs about \$20 per acre, but there is a considerable revenue from the wood cut, which in some cases has been sufficient to make the work pay for itself.

Fire Protection.

Among the greatest dangers to the forests are fires, and in order to prevent their spreading to or from abutting property, and to provide a line of defence on which to fight them, a fire guard 40 feet wide has been cut around the entire outside limit of the marginal lands of the reservoir. There is also a network of forest roads 15 feet wide throughout the reservation, which acts as supplementary fire protection. The brush and weeds are cut from these two protective systems once every year.

A double furrow has been plowed along that portion of the fire guard where there was no stone wall, to check the advance of creeping fires from neighboring property.

On holidays and Sundays, during the dangerous seasons of the year (early spring and late fall), men armed with fire extinguishers patrol the reservation to further protect it from the ravages of forest fires.

Thus far no serious fires have occurred, though several have started which would have caused great damage but for the effectual protection given.

Table of Work accomplished to Jan. 1, 1909.

Total area of nurseries (acres),	8
Total area planted (acres),	1,330
Total number of trees planted: —	
Coniferous,	948,000
Deciduous,	902,000
Total length of reservoir margin planted (miles),	32
Total length of fire guard cleared and maintained (miles),	20.8
Total length of forest roads cleared and maintained (miles),	30
Planted area thinned (acres),	488
Original timber stands thinned (acres),	209

Table of Costs (Wage Rate, \$1.75 per Eight-hour Day).

Nurseries: —

Clearing nursery on south shore,	\$200 00 per acre.
Maintenance of nursery, first-year seedlings,	1 50 per 1,000 trees.
Maintenance of nursery, second and third year seedlings,	1 60 per 1,000 trees per year.

Planting s: —

Clearing areas preparatory to planting,	\$4 00 per acre.
Transplanting seedlings from nursery to field,	5 20 per 1,000 trees.
Transplanting seedlings from nursery to field,	5 50 per acre (6 by 6 feet planting).

Improvement thinnings: —

Among planted trees,	6 00 per acre.
In original timber stands,	20 00 per acre.

Fire protection: —

Clearing marginal fire guard 40 feet wide,	150 00 per mile.
Maintaining marginal fire guard,	27 00 per mile per year.
Clearing and grading forest roads 15 feet wide,	120 00 per mile.
Maintaining forest roads,	8 00 per mile per year.
Maintaining fire patrol,	95 00 per year.

Reforestation. — Summary of Costs (Wage Rate, \$1.75 per Eight-hour Day).

ITEMS.	Per 1,000 Trees planted.	Per Acre planted.
Preparing nurseries,	\$0 40	\$0 56
Seedlings (one year),	1 50	2 09
Transplants (two years),	3 18	4 42
Preparatory clearing,	2 88	4 00
Field planting,	5 20	5 50
Clearing 40-foot fire guard,	76	1 06
Clearing 15-foot forest roads,	1 00	1 35
Maintaining 40-foot fire guard (per year),	14	19
Maintaining 15-foot forest roads (per year),	06	09
Maintaining fire patrol,	02	03
Improvement clearing,	4 30	6 00

The foregoing table shows that it costs \$14.92 per 1,000 trees, or \$18.98 per acre (1,390 trees per acre), to raise the trees from seed, prepare, plant and protect the lands planted through the time of the final planting in the field; that it costs \$0.22 and \$0.31 per year respectively to maintain efficient fire protection; that it costs \$4.30 and \$6 respectively for an improvement thinning, which will probably have to be made twice during the first ten years, after which time the trees should care for themselves.

Yours very truly,

HENRY H. SPRAGUE,

Chairman.

E. R. B. ALLARDICE, superintendent in charge Wachusett department; DEXTER BRACKETT, chief engineer of water works.

ASSISTANTS.

The assistants and employees of the State Forester have practically remained the same throughout the year, and it is a pleasure to compliment them on their fidelity and earnest endeavors in promoting and advancing the State work.

Mr. H. O. Cook, M.F., has done valiant service, particularly in technological lines, as contained in the publication "Mensuration of White Pine," in numerous examinations, etc.

Mr. R. S. Langdell, who has charge of the nursery work and is assisting greatly in the reforestation work, is ever hustling and giving splendid satisfaction, as the nursery and reforestation reports show.

EXPENDITURES AND RECEIPTS.

In accordance with section 6 of chapter 409 of the Acts of 1904, as amended by the Acts of 1907, chapter 473, section 2, the following statement is given of the expenditures for the year ending Nov. 30, 1908:—

Salaries of assistants,	\$3,318 55
Travelling expenses (not included in co-operative fund),	678 89
Stationery and other office supplies,	379 30
Printing,	2,209 78
Postage,	711 99
Express,	175 40
Instruments,	11 34
Miscellaneous,	89 25
Nursery,	2,361 73
	<hr/>
	\$9,936 23
Balance unexpended,	63 77
	<hr/>
Total appropriation,	\$10,000 00

Reforestation Account.

Seedlings,	\$3,495 79
Express,	597 73
Travelling,	61 35
Land,	759 00
Tools,	82 58
	<hr/>
	\$4,996 45
Balance unexpended,	3 55
	<hr/>
Total appropriation,	\$5,000 00

There was realized from the sale of seedlings \$578.55, and for seeds \$74.50, total \$653.05, which amount has been turned over to the Treasurer and Receiver-General; there was also received from the sale of publications \$153.83, which has also been turned in to the Treasurer and Receiver-General, making a grand total of \$806.88. If to this amount is added the amounts unexpended, \$67.32, we have \$874.30 as a credit for the year.

In accordance with section 5 of the above-named chapter, the following statement is given of the receipts for travelling and subsistence: —

Lectures.

Jamaica Plain Unitarian Church, Jamaica Plain,	\$1 02
Fitchburg Merchants' Board of Trade, Fitchburg,	5 00
The Thursday Club, Brookline,	55
Merchants' Association, Pittsfield,	10 50
North Adams Merchants' Association, North Adams,	9 91
Women's Club, Clinton,	2 00
Farmers' Institute, Ashfield,	9 70
Worcester Grange, Worcester,	3 00
Farmers' Club, Franklin (paid by club).	
Wellesley and Needham Farmers' and Mechanics' Club,	
Wellesley,	1 00
Winchendon Citizens, Winchendon,	5 00
State Board of Education, Lunenburg,	4 93
Bridgewater Commercial Club, Bridgewater,	3 50
Waban Women's Club, Waban,	—
Pomona Grange, Foxborough,	2 25
Women's Club, Wellesley Hills,	56
Institute of Technology, Boston,	85
Warren Grange, Warren,	4 80
Village Improvement Society, Marion,	2 50
Women's Club, Lynn,	50
Yarmouth Camp Meeting, Yarmouth,	3 00
Cochituate Grange, Cochituate,	1 00
Springfield Pomona, Wilbraham,	4 75
Beverly Improvement Society, Beverly,	1 00
Sunderland Grange, Sunderland,	4 50
Farmers' Association, Upton,	2 50
Westwood Grange, Westwood,	2 97
Board of Trade, East Bridgewater,	2 00
Pomona Grange, Berlin,	2 50
Pomona Grange, Westfield,	5 50
South Weymouth Grange, South Weymouth,	75

Marlborough Grange, Marlborough,	\$2 50
Beacon Club, Waban,	—
Women's Club, Norwood,	75

A list of the visits made, the area of woodland involved and the receipts for expenses are as follows:—

Examinations of Woodlands.

NAME OF OWNER.	Town.	Area (Acres).	Expense.
Aberthaw Construction Company,	Phillipston,	211	— ¹
Allen, Philip R.,	Walpole,	2	\$1 60
Bridgman, H. F., ²	Shirley,	15	3 05
Bryant, E. A.,	Dover,	75	60
Bates, Gen. A. E.,	Windsor,	1,000	5 00 ³
Bartlett, G. M.,	Templeton,	80	2 50
Bird, C. S.,	Walpole,	60	60
Beebe, Miss E.,	Wilbraham,	400	1 80 ³
Cole, E. E.,	Scituate,	6	— ¹
Hospital School, ²	Canton,	65	1 10
Dennison, H. S.,	Framingham,	100	1 00
Dunbar, E. P.,	West Bridgewater,	8	90
Edwards, George,	Middleborough,	100	1 25
Edson, C. F.,	Wilbraham,	35	— ⁴
Fisher, L. N.,	Walpole,	7	10
Farnsworth, R. M.,	Lancaster,	150	1 75
Fall River Reservoir Commission,	Fall River,	3,000	52 85
Griswoldville Manufacturing Com- pany.	Colrain,	100	4 90
State Colony for Insane,	Gardner,	600	2 90
Hall, A. N.,	Dunstable,	25	1 30
Hall, A. H.,	Leominster,	3	— ⁴
Hayward, E. L.,	Easton,	4	1 00
Harvey, W. A.,	Dover,	160	— ¹
Holton, S. S.,	Lexington,	40	30
Holyoke Water Board,	Holyoke,	2,500	6 70
Howe, L. P.,	Bolton,	7	3 50
Hudson Water Board,	Hudson,	30	1 00
Hutchins, Rev. C. L.,	Concord,	25	80
Kilburn, W. G.,	Lancaster,	7	1 80
King David Lodge,	Taunton,	17	1 65
Leland, E. F.,	Andover,	200	6 00

¹ Paid by owner.

² Made two visits.

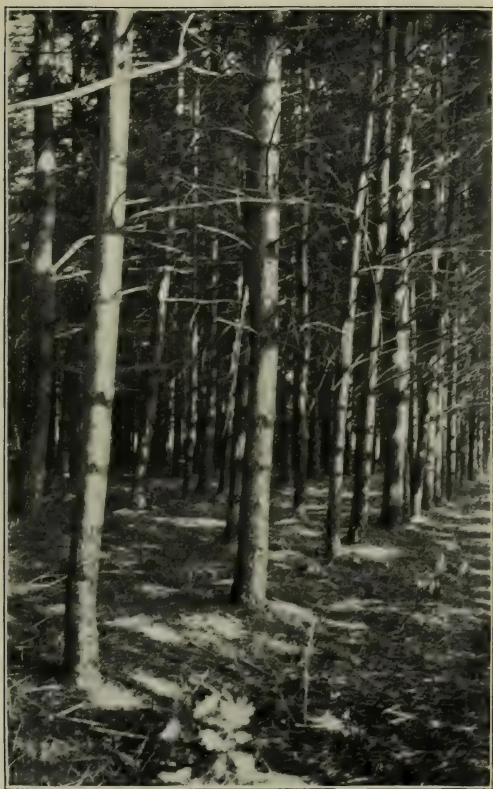
³ Part expense.

⁴ No expense.

Examinations of Woodlands — Concluded.

NAME OF OWNER.	Town.	Area (Acres).	Expense.
Leominster Water Board, . . .	Leominster, . . .	40	\$1 70
Lyman, R. W., . . .	Belchertown, . . .	50	1 00 ¹
Means, Rev. O. W., . . .	Brookfield, . . .	250	2 70
Medfield Insane Asylum, . . .	Medfield, . . .	—	1 10
Payson, W. E., . . .	Norton, . . .	3	1 20
Pease, Miss Laura, . . .	Middleborough, . . .	25	— ²
Plymouth Water Board, . . .	Plymouth, . . .	40	— ²
Randall, C. A., . . .	North Dana, . . .	30	— ²
Rutland Sanatorium, . . .	Rutland, . . .	100	2 10
Seaver, Allyn, . . .	Wilbraham, . . .	127	1 80 ¹
Sedgwick, Alexander, . . .	Stockbridge, . . .	300	6 00 ¹
Snow, R. K., . . .	Wayland, . . .	30	60
Stevens, Chas., . . .	Sudbury, . . .	5	1 25
Stone, C. A., . . .	Plymouth, . . .	200	1 50
Symmington, R. B., ³ . . .	Plymouth, . . .	10	3 20
Thayer, R. P., . . .	South Hadley, . . .	80	2 00 ¹
Walpole High School, . . .	Walpole, . . .	20	— ²
Westfield Water Board, . . .	Granville, . . .	1,000	20 00
Worcester Insane Colony, . . .	Grafton, . . .	500	1 70
Whitney, W. M., . . .	Winchendon, . . .	175	2 65
School for Feeble-minded, . . .	Waltham, . . .	45	— ²
School for Feeble-minded, . . .	Wrentham, . . .	15	1 20
Wyman, H. A., . . .	Lakeville, . . .	400	1 60
Lawrence, Dr., . . .	Lexington, . . .	20	40
Dean, Wm. M., . . .	Taunton, . . .	200	— ²
Sharp, A. R., . . .	Taunton, . . .	600	— ⁴
Pittsfield Water Board, . . .	Pittsfield, . . .	1,500	— ⁴
North Adams Water Board, . . .	North Adams, . . .	125	— ⁴
Prince, F. H., . . .	Wenham, . . .	800	— ⁴
Prescott, C. W., . . .	Concord, . . .	70	— ⁴
Burgess, J. K., . . .	Dedham, . . .	50	— ⁴
Total area, . . .	. . .	15,842	—

¹ Part expense.² No expense.³ Made two visits.⁴ Paid by owner.



A STAND OF WHITE PINE AT SUDBURY, MASS.—

This was a field only partly planted by filling in the blank or open spaces when young; now about thirty-eight years old, and estimated to cut 38,000 feet B. M. per acre. One thousand feet per year of white pine is a fair return from cheap lands. Stumpage is worth \$7 to \$10 per thousand.

WHAT THE GENERAL COURT IS ASKED TO CONSIDER AT PRESENT.

I. To amend the Reforestation Law, so that the State Forester may not be limited to purchasing Forty Acres in Any One Tract.

While, of course, the purpose of the law in stipulating the number of acres was to spread the work out broadly and make it an object lesson of educational value, nevertheless there are often many tracts that exceed this acreage, and it is but natural that the whole tract should be handled at the same time, and thereby much more economically. Where a few acres overruns the stipulated number, it requires an extra survey, and adds greatly to the expense as well in making out the transfer papers. This amendment would be of great assistance in the practical working out of this law.

II. A State Forest Survey.

To authorize a forest survey of the State, in order to determine just what lands should be retained in forests, as an economic factor of the State's conservation policy. With a definite knowledge of conditions mapped out, the State Forester will be greatly aided in the work of reforestation, and have a guide to future endeavor in State work. The survey could be carried out in connection with the working plans department of the State Forester's office, by simply appropriating a certain amount for employing assistance to do the work. Another way of handling the project would be for the State to pay one-half of the expense of such a survey, provided the counties pay one-half. This work need not be accomplished in one year, but taken up in a systematic way, spending only a nominal sum each year until it is finished.

Our people realize the great importance of conserving the forests in the White Mountains and southern Appalachians, and they undoubtedly recognize equally the importance of conserving the forests within our own State, although they are not on so large a scale.

III. *Uniform Forestry Legislation.*

It was the consensus of opinion, as the result of the first New England conference called by the Governors of the New England States, that much mutual benefit could come through uniform legislation. Through a call by the Massachusetts State Forester, the New England State Forestry officials met at the State House, Boston, on December 4, and decided to make the following general recommendations for consideration by their respective State Legislatures:—

(a) *Resolved*, That the cost of extinguishing fires known to be set by railroads shall be paid for by said railroad corporations.

(b) *Resolved*, That when forest fires are caused by individuals, the individuals causing said fires shall be liable for all expense of their extinguishment.

(c) *Resolved*, That it is the opinion of the committee that the present Massachusetts forest fire law relative to giving permits for the burning of brush and setting of fires out of doors should be adopted for all the States.

(d) *Resolved*, That we believe in legislation to regulate the management of forest lands, and that a permit be required by operators of portable mills from the State forest officials.

(e) *Resolved*, That there should be a law in each State, similar to the Vermont law, authorizing the Governor to issue a proclamation, when it is thought advisable by the State forest official, prohibiting sportsmen and others from traversing the woods unnecessarily.

(f) *Resolved*, That there should be definite understandings with the railroads and State forestry officials as to the dangerous sections of the railroad lines traversing the respective States, so that patrols by the railroads may be established whenever it is thought advisable by the State.

(g) *Resolved*, That there should be a law to regulate the taking of firearms into the woods during the closed season on game.

IV. *Increased Appropriation needed.*

The State Forester feels it none other than his duty to ask for an increased appropriation for his work this coming year.

If examined carefully, it can be shown that the expenditure for reforestation and nursery work, while in itself an expenditure by the State, must ultimately come back to the

State treasury with interest. This, therefore, eliminates as a real out-go from the State treasury fully one-half of the annual appropriation made for this office.

We are convinced that the enactments passed in recent years are proving their value. Now that we have our corps of 350 forest wardens appointed and in the harness, let us give them every legitimate worthy support possible. With an early convention of the forest wardens, I am sure the results to come from such would be regained financially an hundred fold in a single year. The State Forester could utilize the services of forest wardens in various towns to a great advantage along many mutual lines, were there more funds that would permit it. Where such work is left to the towns, many are likely to be indifferent, while, if awakened by a general current of live endeavor on the part of the State, they catch the spirit and realize the importance of self-preservation. As soon as we have our forest wardens thoroughly familiar with the great good to be accomplished, they are going to impart its importance to the towns they represent.

As I stated last year, the State Forester hopes to so educate his wardens that they will become in a sense town foresters, who shall keep the importance of forestry and how to perpetuate and manage the same practically directly before the people. With such an organization, when gypsy moths, pine blight, fires, etc., are troublesome, or, on the other hand, when people desire to reforest lands or thin and give proper care to their wood lots, in either case here is a man to whom they may look for advice. Is not the State making an expenditure here that will ultimately bring a great reward?

In establishing workable State forest policies, as in every other new undertaking that requires an expenditure of money, we are inclined to be conservative. When we realize, however, that many of our small towns are paying large sums annually simply for fighting forest fires, which expenditure is a constant drain and too often a total loss, to say nothing about the actual loss in present and future forest products, I am sure that business and thinking men can see that it is simply a losing proposition not to definitely and at

once spend a few dollars that will make it possible to save millions in the future.

The State Forester could spend to great advantage in the coming year \$25,000 in systematizing and furthering the forestry interests throughout the Commonwealth. Of this sum, \$10,000 is already provided for in the reforestation act of last year. The regular appropriation for the running expenses and general work of the State Forester for the past year was \$10,000; therefore, the appropriation asked for would be an increase of \$5,000.

SUMMARY OF RECOMMENDATIONS.

(1) That the reforestation law be amended so as not hereafter to limit the purchases of land to 40-acre tracts.

(2) That a State forest survey be established, and funds for its accomplishment be provided.

(3) That the six resolutions of the New England State forestry officials be considered with a view to their adoption for uniform forestry laws. One recommendation is already in the Massachusetts statutes.

(4) That the appropriation for the State Forester's work be \$25,000 for this year, \$10,000 of which is already provided for in the reforestation act.

Respectfully submitted,

F. W. RANE,
State Forester.

2

THE
STATE FORESTER
OF
MASSACHUSETTS.

SIXTH ANNUAL REPORT
1909.

F. W. RANE, STATE FORESTER.



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The Commonwealth of Massachusetts.

To the General Court.

It is with great pleasure that I submit this the sixth annual report of the State Forester of this Commonwealth.

Owing to the fact that the work of suppressing the gypsy and brown-tail moths has been placed under this department by the last Legislature, this report is divided into two parts:—

Part I. General Forestry.

Part II. Gypsy and Brown-tail Moth Work.

This report is submitted in accordance with the provisions of chapter 409, section 5, Acts of 1904, and contains a statement of the results obtained during the year 1909, together with a record of expenditures and recommendations concerning the future needs of the department.

Respectfully submitted,

F. W. RANE,

State Forester.

DEC. 31, 1909.

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SAVORY WAYS, IN THE TOWN OF CARVER.—The planter of these trees by the roadside was a public benefactor. If white pines will grow as well as this along a dry and compact roadside in forty years, imagine what better forestry could accomplish throughout our State.

The Commonwealth of Massachusetts.

SIXTH ANNUAL REPORT OF THE STATE FORESTER.

INTRODUCTION.

Never has there been a time in the history of the State when forestry matters more need the wholesome consideration of your honorable body than the present. Forestry and forest products have been our birthright, and we do well to reflect upon their importance to the present in the building of our ship of State, and not lose sight of the necessity of conserving them for our future needs. The histories of older nations are an open book to us, and tell only too well their pathetic tale.

The year has been one of great activity, and forestry interests have been given more recognition than ever before. The forestry legislation has been well received by our people. It may not be in good taste to boast of our new laws, but we do wish it known that the American Forestry Association has recommended several of our enactments for general adoption.

During the present year the results from organization and a more definite policy have been very evident. The forest warden system, which was fully explained in last year's report, has been very effective, and we have but just begun to see its usefulness. It takes time to create a proper forestry sentiment, let alone appreciation. Not only have a larger per cent. of the forest wardens and their deputies shown increased interest this year, but many, — a great many, — of our most public-spirited and influential people from every section of the State have co-operated in the forward movement of forestry endeavors.

The services of the State Forester have been in constant demand, not only in making examinations and giving advice on forestry matters, but for lectures, demonstrations and for-

estry literature. More fire warning notices and forest law posters have been distributed and actually found posted in the towns of the Commonwealth than ever before.

The permit act for setting fires out of doors was very generally adopted last spring by the towns and cities throughout the State, and it is the opinion of the wardens generally that this legislation alone will be a great saving to the State from forest fires.

For the first time the forest wardens have been gathered together at conferences, which will be explained in detail elsewhere in this report. In thus acquainting these officers with their duties, we shall secure an efficiency not possible heretofore.

By an act of the last General Court the work of suppressing the gypsy and brown-tail moths was placed under the State Forester. This bill was signed by Governor Draper on March 14. Since that time, of course, the State Forester's duties have been greatly enlarged. It was found advisable to unite the offices, and, as there was not sufficient room to accommodate both departments in the State House, the office of the State Forester was transferred to No. 6 Beacon Street, tenth floor. In the readjustment of these two departments under one head, the aim has been to retain and adopt all the better features of each organization. The experience of the first half-year has resulted in a more effective organization than has seemed possible.

Ever since coming to Massachusetts in the capacity of State Forester, my work has certainly been met with public-spirited encouragement; and now, under my enlarged duties, I simply ask that you give me the same cordial and co-operative support as in the past. Any State department, having the spending of money for the public good, appreciates and covets assistance from the people generally. We propose to have a "live wire" organization in all our undertakings in the State Forester's work; and I believe I am not overstating it when I say that the citizens of Massachusetts generally are in accord in requesting you, the General Court, to enact laws sufficient for our present and future forestry interests.

ORGANIZATION.

The placing of the moth work under the State Forester by the Legislature and through the recommendation of Governor Draper necessitated a reorganization of the work, to meet the new requirements of the office.

It is to be expected that in the union of forces it will take time to adjust the machinery to the new conditions; but I am frank to say that all members of the organization have adapted themselves most happily to the new system, and, although nine months only have passed, the work is running on smoothly. What is true in this respect in the office force is equally true in the field work. The moth men are not only showing renewed interest in their work, but are assisting in perfecting better forestry conditions, assuming responsibility, and showing interest in preventing and extinguishing forest fires. The forestry assistants are helping in such work as marking the trees and superintending the thinning work so necessary in combating gypsy moths, and at the same time benefiting the growth from a modern forestry standpoint.

After going over the organization carefully and discussing the matter fully with men experienced in the work, under the sanction of the Governor, the 6 divisions into which the moth-infested district was formerly divided were reorganized, and increased to 15. With 6 divisions each agent in charge had an average of 35 towns to look after, and he was allowed a number of inspectors to accomplish the necessary field work. In all, 53 men were employed in the old organization. In the new organization of 15 divisions the 6 agents were given the more difficult ones, and the remaining 9 were filled by experienced inspectors. Four other inspectors were retained for special duties, subject to the direction of the main office. From 53 men, therefore, the force has been cut down to 19, and by furnishing the present division superintendents with motor cycles, with only 12 to 15 towns to cover, they can readily keep in close touch with local conditions. Not only do I believe that our efficiency is greater, but in a year's time it is believed the saving to the Commonwealth, even after deducting the expense of motor cycles, will be \$8,000 to \$10,000.

The next step needed is in raising the standard of the local town superintendents. The moth work has now progressed far enough so that competent men are available, and it is poor business policy to be compelled to have the work in some towns and cities in the hands of men utterly unable to get the best possible results.

The present organization of the State Forester's staff is as follows: —

STAFF.

Mr. F. W. RANE, B.Agr., M.S.,	. State Forester.
Mr. L. H. WORTHLEY,	. Assistant Forester, in charge of moth work.
Mr. H. O. COOK, M.F.,	. Assistant Forester, in charge of forestry management.
Mr. R. S. LANGDELL,	. Assistant Forester, in charge of nursery work.
Mr. GOULD, M.F.,	. Assistant Forester.
Mr. CHAS. O. BAILEY,	. Secretary.
Miss ELIZABETH HUBBARD,	. Clerk, in charge of accounts.
Mr. F. P. WOODBURY, A.B.,	. Clerk, in charge of forest fire records.
Miss CHARLOTTE JACOBS,	. Clerk, in charge of mail and office.
Mr. GEORGE A. SMITH,	. Agent, Division 1, as follows: Chelsea, Danvers, Everett, Hamilton, Ipswich, Lynn, Lynnfield, Marblehead, Middleton, Nahant, Peabody, Revere, Salem, Swampscott, Wenham and Winthrop.
Mr. JOHN W. ENWRIGHT,	. Agent, Division 2, as follows: Arlington, Bedford, Billerica, Burlington, Lexington, Malden, Medford, Melrose, Reading, Saugus, Stoneham, Wakefield, Wilmington, Winchester and Woburn.
Mr. CHAS. W. MINOTT,	. Agent, Division 3, as follows: Belmont, Brookline, Cambridge, Concord, Lincoln, Natick, Needham, Newton, Somerville, Sudbury, Waltham, Watertown, Wayland, Wellesley and Weston.
Mr. FRANK A. BATES,	. Agent, Division 4, as follows: Abington, Avon, Braintree, Cohasset, Hanover, Hingham, Holbrook, Hull, Milton, Norwell, Quincy, Randolph, Rockland, Scituate and Weymouth.
Mr. FRANCIS C. WORTHEN,	. Division Superintendent, Division 5, as follows: Amesbury, Boxford, Georgetown, Groveland, Merrimac, Newbury, Newburyport, Rowley, Salisbury, Topsfield and West Newbury.
Mr. HENRY F. ARMSTRONG,	. Division Superintendent, Division 6, as follows: Andover, Chelmsford, Dracut, Haverhill, Lawrence, Lowell, Methuen, North Andover, North Reading and Tewksbury.
Mr. THOMAS W. EMERSON,	. Division Superintendent, Division 7, as follows: Acton, Ayer, Boxborough, Carlisle, Dunstable, Groton, Littleton, Pepperell, Townsend, Tyngsborough and Westford.

Mr. CLARENCE W. PARKHURST,	Division Superintendent, Division 8, as follows: Ashland, Bellingham, Dover, Framingham, Franklin, Holliston, Medfield, Medway, Millis, Norfolk and Sherborn.
Mr. WM. A. HATCH,	Division Superintendent, Division 9, as follows: Canton, Dedham, Foxborough, Hyde Park, Norwood, Plainville, Sharon, Stoughton, Walpole, Westwood and Wrentham.
Mr. GEORGE A. SANDS,	Division Superintendent, Division 10, as follows: Blackstone, Grafton, Hopedale, Hopkinton, Hudson, Marlborough, Maynard, Mendon, Milford, Northborough, Northbridge, Southborough, Stow, Upton, Uxbridge and Westborough.
Mr. HARRY B. RAMSEY,	Agent Division 11, as follows: Ashby, Auburn, Berlin, Bolton, Clinton, Fitchburg, Gardner, Greenfield, Harvard, Holden, Lancaster, Leicester, Leominster, Lunenburg, Millbury, Oxford, Palmer, Princeton, Shirley, Shrewsbury, Springfield, Sutton, Templeton, Warren, Westminster and Worcester.
Mr. JOHN A. FARLEY,	Agent, Division 12, as follows: Carver, Duxbury, Halifax, Hanson, Kingston, Marshfield, Pembroke, Plymouth, Plympton and Whitman.
Mr. LEWIS W. HODGKINS,	Agent, Division 13, as follows: Attleborough, Bridgewater, Brockton, East Bridgewater, Easton, Lakeville, Mansfield, Middleborough, North Attleborough, Raynham, Taunton and West Bridgewater.
Mr. JOHN F. CARLETON,	Division Superintendent, Division 14, as follows: Barnstable, Bourne, Brewster, Dennis, Falmouth, Marion, Mashpee, Orleans, Rochester, Sandwich, Truro, Wareham, Wellfleet and Yarmouth.
Mr. SAUL PHILLIPS,	Division Superintendent, Division 15, as follows: Beverly, Essex, Gloucester, Manchester, North Shore Woodlands and Rockport.

CO-OPERATIVE SCIENTIFIC STAFF.

L. O. HOWARD, Ph.D.,	Chief United States Bureau of Entomology, Washington, D. C., <i>Parasites and Predaceous Insects</i> .
THEOBALD SMITH, Ph.B., M.D.,	Professor of Comparative Pathology, Harvard University, <i>Diseases of Insects</i> .
ROLAND THAXTER, Ph.D.,	Professor of Cryptogamic Botany, Harvard University, <i>Fungous Diseases affecting Insects</i> .
E. L. MARK, Ph.D., LL.D.,	Director of the Zoölogical Laboratory, Harvard University, <i>Protozoa and Insect Life</i> .
W. M. WHEELER, Ph.D.,	Professor of Entomology, Harvard University, <i>Experimental Entomologist</i> .
C. H. FERNALD, Ph.D.,	Professor of Entomology, Massachusetts Agricultural College, <i>Consulting Entomologist</i> .
M. L. GUPTIL,	Expert experimentalist.
FRANK H. MOSHIER,	Entomologist in charge of laboratory.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS.

[Alphabetically by towns.]

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Abington, . . .	287	B. Ernest Wilkes, chief fire department,	C. Frederick Shaw.
Acton, . . .	181	William H. Kingsley,	James O'Neil.
Acushnet, . . .	275	Eben F. Leonard,	- -
Adams, . . .	7	John Clancy,	- -
Agawam, . . .	93	Edward M. Hitchcock,	- -
Alford, . . .	24	John H. Wilcox,	- -
Amesbury, . . .	228	James E. Feltham, chief fire department.	A. L. Stover.
Amherst, . . .	67	G. E. Stone, tree warden,	- -
Andover, . . .	212	J. H. Playdon, tree warden,	J. H. Playdon.
Arlington, . . .	193	Walter H. Pierce, chief fire department,	William H. Bradley.
Ashburnham, . .	104	William D. Miller,	- -
Ashby, . . .	158	Wm. S. Green,	H. A. Lawrence.
Ashfield, . . .	50	Chas. A. Hall,	- -
Ashland, . . .	200	H. H. Piper,	H. G. Spring.
Athol, . . .	105	Frank P. Hall, chief fire department, .	- -
Attleborough, . .	265	Hiram Packard, 3 Hope Street, chief fire department.	Wm. E. S. Smith.
Auburn, . . .	123	J. Fred Searle,	- -
Avon, . . .	259	E. Walter Packard, constable,	Willard W. Beals.
Ayer, . . .	169	Charles E. Perrin,	Loring A. Carman.
Barnstable, . . .	315	Henry C. Bacon, P. O. Hyannis,	Harry W. Bodfish.
Barre, . . .	142	D. H. Rice,	- -
Becket, . . .	23	Elmer D. Ballou,	- -
Bedford, . . .	179	Chas. E. Williams,	W. A. Cutler.
Belchertown, . .	73	James A. Peeso, constable,	- -
Bellingham, . . .	326	L. F. Thayer, town treasurer,	Henry A. Whitney.
Belmont, . . .	194	John F. Leonard, chief fire department,	Chas. F. Houlahan.
Berkley, . . .	271	Gideon H. Babbitt,	- -
Berlin, . . .	139	Walter Cole, constable,	Willis Rice.
Bernardston, . .	39	E. E. Benjamin,	- -
Beverly, . . .	220	Robert H. Grant, chief fire department,	Josiah B. Brown.
Billerica, . . .	173	Geo. C. Crosby, chief engineer fire department.	Francis J. Dolan.
Blackstone, . . .	114	Thomas Reilly,	- -
Blandford, . . .	81	H. K. Herrick,	- -
Bolton, . . .	146	Frank A. Powers, tree warden,	Chas. E. Mace.
Boston, ¹ . . .	-	- - -	D. Henry Sullivan.

¹ No forest area.

List of Forest Wardens and Local Moth Superintendents — Con.

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Bourne, . . .	311	Emory A. Ellis, P. O. Bournedale, . . .	Stillman B. Wright.
Boxborough, . . .	182	M. L. Wetherbee, selectman, . . .	John J. Sherry.
Boxford, . . .	218	Harry L. Cole, selectman, . . .	Chas. Perley.
Boylston, . . .	138	Chas. S. Knight, metropolitan watchman.	— —
Braintree, . . .	244	James M. Cutting, special police, P. O. South Braintree.	E. E. Abercrombie.
Brewster, . . .	318	T. B. Tubman, highway surveyor, P. O. North Brewster.	David A. Newcomb.
Bridgewater, . . .	293	Edwin S. Rhoades,	Robert J. McNeeland.
Brimfield, . . .	99	Edward J. Prindle,	— —
Brockton, . . .	286	Harry C. Marston, chief fire department.	Edward Moltan.
Brookfield, . . .	120	David N. Hunter,	— —
Brookline, . . .	237	Geo. H. Johnson, chief fire department,	Ernest B. Dane.
Buckland, . . .	49	William Sauer, P. O. Shelburne Falls,	— —
Burlington, . . .	178	Walter L. Skelton, tree warden, . . .	Walter W. Skelton.
Cambridge, ¹ . . .	—	— — —	J. F. Donnelly.
Canton, . . .	249	Laurence Horton, fire engineer, P. O. Ponkapoag.	Augustus Hemenway.
Carlisle, . . .	171	Herbert P. Dutton, selectman, . . .	G. G. Wilkins.
Carver, . . .	304	Eugene E. Shaw,	Herbert F. Atwood.
Charlemont, . . .	42	Fred D. Legate,	— —
Charlton, . . .	115	Carlos Bond,	— —
Chatham, . . .	320	Geo. H. Eldredge,	— —
Chelmsford, . . .	172	Arthur E. Barton,	M. A. Bean.
Chelsea, ¹ . . .	—	— — —	J. A. O'Brien.
Cheshire, . . .	11	Chas. D. Cummings,	— —
Chester, . . .	80	William H. Babb,	— —
Chesterfield, . . .	63	Chas. A. Bisbee, P. O. Bisbee, . . .	— —
Chicopee, . . .	87	John H. Pomphret, chief fire department.	— —
Chilmark, . . .	308	Ernest C. Mayhew,	— —
Clarksburg, . . .	3	Robert Lanfair, R. F. D. No. 1, P. O. North Adams.	— —
Clinton, . . .	145	Daniel W. Goss, 40 East Street, . . .	Wm. McGown.
Cohasset, . . .	246	Wm. J. Brennock, captain fire department.	Joseph E. Grassie.
Colrain, . . .	37	Wm. H. Davenport,	— —
Concord, . . .	180	G. E. Morrell, chief fire department, . .	H. P. Richardson.
Conway, . . .	51	Chas. Parsons, tree warden, . . .	— —
Cumington, . . .	60	W. S. Gabb, P. O. Swift River, . . .	— —
Dalton, . . .	14	William M. Colton, forester, Flint Stone Farm.	— —
Dana, . . .	147	Elmer A. Collier, chief fire department, P. O. North Dana.	— —

¹ No forest area.

List of Forest Wardens and Local Moth Superintendents — Con.

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Danvers, . . .	210	Thos. E. Tinsley, tree warden, . . .	Thos. E. Tinsley.
Dartmouth, . . .	278	John W. Howland, P. O. North Dartmouth.	- -
Dedham, . . .	241	George A. Phillips,	George A. Phillips.
Deerfield, . . .	52	Wm. L. Harris, selectman, . . .	- -
Dennis, . . .	317	Alpheus P. Baker, constable, P. O. South Dennis.	H. H. Sears.
Dighton, . . .	272	Ralph Earle,	- -
Douglas, . . .	112	W. L. Church, county commissioner, .	- -
Dover, . . .	240	John Breagy,	Arthur Hagerty.
Dracut, . . .	163	Daniel D. Fox,	Herbert C. Jones.
Dudley, . . .	110	F. A. Putnam,	- -
Dunstable, . . .	161	Dexter Butterfield,	James A. Davis.
Duxbury, . . .	303	Fred B. Knapp, master Powder Point School.	Henry A. Fish.
E. Bridgewater, .	298	Loren A. Flagg, chief fire department, P. O. Elmwood.	Wm. T. Greene.
E. Longmeadow, .	95	Asher Markham,	- -
Eastham, . . .	322	W. Horton Nickerson, road surveyor,	- -
Easthampton, . .	77	Frank P. Newkirk, tree warden, .	- -
Easton, . . .	264	John Baldwin, chief fire department, P. O. North Easton.	R. W. Melendy.
Edgartown, . . .	309	George N. Cleveland,	- -
Egremont, . . .	29	Frank W. Bradford, Great Barrington, R. F. D. No. 3.	- -
Enfield, . . .	74	Chas. W. Felton,	- -
Erving, . . .	46	Ch. H. Holmes, selectman, P. O. Farley,	- -
Essex, . . .	233	Otis O. Story, tree warden, . . .	Otis O. Story.
Everett, ¹ . . .	-	- - - -	James Davidson.
Fairhaven, . . .	276	Albert C. Aiken,	- -
Fall River, . . .	280	William Mulligan, tree warden, . .	- -
Falmouth, . . .	312	J. M. Watson,	W. B. Bosworth.
Fitchburg, . . .	157	Geo. H. Hastings, superintendent, .	Geo. H. Hastings.
Florida, . . .	5	Fred R. Whitcomb, P. O. Hoosac Tunnel.	- -
Foxborough, . . .	261	Ernest A. White, chief fire department and constable.	Frank C. Carpenter.
Framingham, . . .	197	James Stalker, P. O. South Framingham, assistant tree warden.	N. I. Bowditch.
Franklin, . . .	255	Edward S. Cook, dealer in wood and lumber.	M. J. Van Leeuwen.
Freetown, . . .	274	Andrew M. Hathaway, P. O. Assonet,	- -
Gardner, . . .	153	Theodore W. Danforth,	T. W. Danforth.
Gay Head, . . .	343	Leander B. Smally, Menemsha, Mass.,	- -
Georgetown, . . .	224	Clinton J. Eaton,	Edward J. Watson.
Gill, . . .	45	Lewis C. Munn,	- -

¹ No forest area.

List of Forest Wardens and Local Moth Superintendents — Con.

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Gloucester, . . .	234	— — —	Herbert J. Worth.
Goshen, . . .	61	Sidney F. Packard, P. O. R. F. D. No. 2, Williamsburg.	— —
Gosnold, . . .	344	Harold S. Veeder, P. O. Cuttyhunk, .	— —
Grafton, . . .	125	Sumner F. Leonard, overseer of the poor.	Chas. K. Despeau.
Granby, . . .	79	C. N. Rust,	— —
Granville, . . .	91	Laurence F. Henry, selectman, . . .	— —
Gt. Barrington, . .	25	Daniel W. Flynn, 54 Russell Street, .	— —
Greenfield, . . .	44	William A. Ames, tree warden, . . .	Wm. A. Ames.
Greenwich, . . .	327	William H. Walker, P. O. Greenwich Village.	— —
Groton, . . .	167	James B. Harrington, chief fire department.	William A. Woods.
Groveland, . . .	225	Sidney E. Johnson, 311 Center Street,	Raymond B. Larive.
Hadley, . . .	66	Edward P. West, tree warden, . . .	— —
Halifax, . . .	299	Edwin H. Vaughan, assessor, . . .	Frank D. Lyon.
Hamilton, . . .	222	Fred Berry, P. O. Essex, R. F. D., .	Fred A. Nason.
Hampden, . . .	97	John S. Swenson,	— —
Hancock, . . .	9	Chas. F. Tucker,	— —
Hanover, . . .	295	Chas. E. Damon, P. O. Box 113, North Hanover.	Lyman Russell.
Hanson, . . .	296	Albert L. Dame, tree warden, P. O. South Hanson.	A. L. Dame.
Hardwick, . . .	141	Myron N. Ayres, constable,	— —
Harvard, . . .	152	Benjamin J. Priest,	Geo. C. Maynard.
Harwich, . . .	319	John Condon,	— —
Hatfield, . . .	65	John M. Strong, P. O. West Hatfield,	— —
Haverhill, . . .	216	John B. Gordon, chief fire department,	Geo. F. Moore.
Hawley, . . .	48	Ernest R. Seare, tree warden, P. O. Charlemont.	— —
Heath, . . .	36	S. G. Benson,	— —
Hingham, . . .	289	Geo. Cushing, chief fire department, .	Arthur W. Young.
Hinsdale, . . .	15	Lewis B. Bague, tree warden, . . .	— —
Holbrook, . . .	247	E. W. Austin,	William Hayden.
Holden, . . .	136	Henry E. Holt,	H. E. Holt.
Holland, . . .	101	O. F. Howlett, P. O. Southbridge, R. F. D. No. 2.	— —
Holliston, . . .	202	Waldo E. Collins,	Geo. H. Moody.
Holyoke, . . .	85	Chas. C. Hastings,	— —
Hopedale, . . .	328	Walter F. Durgin, constable, superintendent of parks.	Walter F. Durgin.
Hopkinton, . . .	201	R. I. Frail,	John T. Riley.
Hubbardston, . . .	149	Ernest A. Young, tree warden, . . .	— —
Hudson, . . .	199	Fred W. Trowbridge, chief fire department.	R. H. Hapgood.
Hull, . . .	329	Smith F. Sturges, tree warden, P. O. Allerton.	John Knowles.

List of Forest Wardens and Local Moth Superintendents — Con.

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Huntington, .	70	Daniel B. Mack, constable, . . .	- -
Hyde Park, .	330	Harry G. Higbee,	Harry G. Higbee
Ipswich, . .	223	Augustus J. Barton,	James A. Morey.
Kingston, . .	301	Thos. W. Bailey, selectman, . . .	Carl C. Faunce.
Lakeville, . .	283	Nathan F. Washburn, P. O. Middleborough.	S. T. Nelson.
Lancaster, . .	151	Everett M. Hawkins, chief fire department.	Geo. F. Morse, Jr.
Lanesborough, .	10	King D. Keeler, constable, . . .	- -
Lawrence, . .	214	Chas. G. Rutter, chief fire department,	Isaac Kelley.
Lee,	22	James W. Bossidy,	- -
Leicester, . .	122	Walter E. Sprague,	J. H. Woodhead.
Lenox, . . .	18	Geo. W. Fitch,	- -
Leominster, . .	155	William K. Morse, chief fire department, P. O. North Leominster.	S. R. Walker.
Leverett, . .	57	Orman C. Marvel, assessor, . . .	- -
Lexington, . .	188	Azor P. Howe,	E. P. Merriam.
Leyden, . . .	38	Herman W. Severance, Bernardston, .	- -
Lincoln, . . .	187	Edward R. Farrer, tree warden, . .	Edward R. Farrar.
Littleton, . .	170	Chas. F. Johnson, town clerk, . . .	Alfred Hopkins.
Longmeadow, .	94	Oscar C. Pomeroy,	- -
Lowell, . . .	165	Edward S. Hosmer, chief fire department.	Charles A. Whittett.
Ludlow, . . .	88	Edward E. Chapman, constable, . .	- -
Lunenburg, . .	156	Clayton E. Stone,	Stephen Farnsworth.
Lynn,	331	Nathan M. Hawkes, park commissioner,	Albert C. Doal.
Lynnfield, . .	209	Thos. E. Cox, P. O. Wakefield R. F. D.,	Alfred W. Copeland.
Malden, . . .	191	Frank Turner,	Geo. W. Stiles.
Manchester, . .	236	Frederick Burnham,	John D. Morrison.
Mansfield, . .	263	Herbert E. King,	W. O. Sweet.
Marblehead, . .	332	William H. Stevens,	William H. Stevens, 2d.
Marion, . . .	306	Isaac E. Hiller,	James H. Morss.
Marlborough, .	198	Chas. H. Andrews, chief fire department.	M. E. Lyons.
Marshfield, . .	292	Edward E. Ames,	P. R. Livermore.
Mashpee, . . .	313	Joseph A. Peters,	Watson F. Hammond.
Mattapoissett, .	281	Everet C. Stetson,	- -
Maynard, . . .	184	Arthur J. Coughlan, room 17, Maynard's block.	Albert C. Coughlin.
Medfield, . . .	252	Waldo E. Kingsley, chief fire department.	Geo. L. L. Allen.
Medford, . . .	192	Chas. Bacon, chief fire department, .	Wm. J. Gannon.
Medway, . . .	254	Clyde C. Hunt, captain fire department.	Frank Hager.
Melrose, . . .	-	- - -	John J. McCullough.

List of Forest Wardens and Local Moth Superintendents — Con.

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Mendon, . . .	119	Geo. B. Cromb,	Frank M. Aldrich.
Merrimac, . . .	227	Edgar P. Sargent,	Frank E. Bartlett.
Methuen, . . .	213	Herbert B. Nichols,	Alfred H. Wayland.
Middleborough, . .	284	C. W. Weston,	John C. Chase.
Middlefield, . . .	342	Thos. H. Fleming, P. O. Bancroft, . .	- -
Middleton, . . .	211	Oscar H. Sheldon,	Benj. T. McGlauffin.
Milford, . . .	127	Elbert M. Crockett, chief fire department.	Patrick F. Fitzgerald.
Millbury, . . .	124	William E. Horn,	Edward F. Roach.
Millis, . . .	253	Chas. La Croix,	Fred Holland.
Milton, . . .	242	Nathaniel T. Kidder, park commissioner.	Nathaniel T. Kidder.
Monroe, . . .	34	S. R. Tower,	- -
Monson, . . .	98	Omer E. Broadway,	- -
Montague, . . .	53	Fred W. Lyman, lumber dealer, . .	- -
Monterey, . . .	28	Andrew J. Hall,	- -
Montgomery, . . .	82	Frank C. Preston, P. O. Huntington, .	- -
Mt. Washington, .	30	Fred Porter,	- -
Nantucket, . . .	333	Albert R. Coffin,	- -
Nahant, ¹ . . .	-	- - -	Thos. Roland.
Natick, . . .	204	William E. Daniels,	H. H. Hunnewell.
Needham, . . .	238	Howard H. Upham, captain fire department.	Ernest E. Riley.
New Ashford, . . .	6	Wm. E. Baker,	- -
New Bedford, . . .	277	Edward F. Dahill, chief fire department.	- -
New Braintree, . .	131	E. L. Haven,	- -
New Marlborough, .	32	Dennis Hayes, P. O. Mill River, . .	- -
New Salem, . . .	55	Rawson King, P. O. Cooleyville, . .	- -
Newbury, . . .	231	William P. Bailey,	O. B. Tarbox.
Newburyport, . . .	230	David Kent, 26 Arlington Street, . .	Charles P. Kelley.
Newton, . . .	205	Walter B. Randlett, chief fire department, P. O. West Newton.	Chas. J. Bucknam.
Norfolk, . . .	256	C. Albert Murphy,	C. Albert Murphy.
North Adams, . . .	4	H. J. Montgomery, chief fire department.	- -
North Andover, . .	215	Geo. A. Rea,	Peter Holt.
N. Attleborough, .	262	Harvey W. Tufts, chief fire department,	F. P. Toner.
N. Brookfield, . .	129	H. S. Lytle, chief fire department, . .	- -
N. Reading, . . .	175	Irving F. Batchelder,	Geo. E. Eaton.
Northampton, . . .	72	Frederick E. Chase,	- -
Northborough, . . .	140	T. P. Haskell,	T. P. Haskell.

¹ No forest area.

List of Forest Wardens and Local Moth Superintendents — Con.

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Northbridge, .	117	W. E. Beemap, P. O. Whitinsville, .	Arthur F. Whitin.
Northfield, .	40	Fred W. Doane,	- -
Norton, . .	266	Alden G. Walker,	- -
Norwell, . .	290	John Wahlen,	John H. Sparrell.
Norwood, . .	250	J. Fred Boyden, chief fire department,	H. Frank Winslow.
Oak Bluffs, .	334	Samuel N. Kidder,	- -
Oakham, . .	135	Chas. H. Trowbridge,	- -
Orange, . .	47	Chas. E. Lane,	- -
Orleans, . .	321	Chas. F. Poor,	Albert A. Smith.
Otis, . . .	27	Wilbur L. Strickland,	- -
Oxford, . .	335	A. W. Stafford, North Oxford, . .	Chas. G. Larned.
Palmer, . .	89	James Summers, chief fire department, P. O. Box 333.	C. H. Keith.
Paxton, . .	130	Geo. W. Van Wyke,	- -
Peabody, . .	219	Michael V. McCarthy, Forest Street, .	James F. Callahan.
Pelham, . .	68	E. P. Bartlett, P. O. Amherst, . .	- -
Pembroke, .	294	Jos. J. Shepherd,	Calvin S. West.
Pepperell, .	160	Geo. G. Tarbell, P. O. East Pepperell, Room 17, Aldine block.	John Tune.
Peru, . . .	16	Clarence W. Hathaway,	- -
Petersham, .	148	George P. Marsh,	- -
Phillipston, .	106	William Cowbleck, Athol, R. F. D. No 3.	- -
Pittsfield, .	13	Lucien D. Hazard,	- -
Plainville, .	59	J. F. Thompson,	E. C. Blackwell.
Plainfield, .	309	Lestan E. Parker,	- -
Plymouth, .	302	Herbert Morissey,	Geo. R. Briggs.
Plympton, .	300	Thomas W. Blanchard,	Zina E. Sherman.
Prescott, . .	69	Waldo H. Pierce, P. O. Greenwich Village.	- -
Princeton, .	150	J. Heyden Stimpson,	J. Harry Allen.
Provincetown, .	325	James H. Barnett,	- -
Quincy, . .	243	Peter J. Williams, chief fire department.	Randolph C. Bain- bridge.
Randolph, . .	248	Chas. A. Wales, chief fire department,	James E. Blanche.
Raynham, . .	270	John V. Festing,	Geo. M. Leach.
Reading, . .	176	Herbert E. McIntire,	Guy A. Hubbard.
Rehoboth, . .	268	Silas A. Pierce,	- -
Revere, ¹ . .	-	- - -	George Babson.
Richmond, . .	17	T. B. Salmon,	- -
Rochester, . .	282	William N. Smellie,	- -

¹ No forest area.

List of Forest Wardens and Local Moth Superintendents — Con.

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Rockland, . . .	288	John H. Burke, water commissioner, .	Frank H. Shaw.
Rockport, . . .	235	A. J. McFarland, P. O. Box 91, .	Eli Gott.
Rowe, . . .	35	Merritt A. Peck,	- -
Rowley, . . .	232	Daniel O'Brien, agent Gypsy Moth Commission.	Daniel O'Brien.
Royalston, . . .	102	Willard W. White, P. O. South Royalston.	- -
Russell, . . .	83	Sidney F. Shurtleff, highway surveyor,	- -
Rutland, . . .	143	Henry Converse, chief fire department,	- -
Salem, ¹ . . .	-	- - -	Amos Stillman.
Salisbury, . . .	229	Wm. H. Evans,	Chas. M. Pike.
Sandisfield, . . .	33	Lyman H. Clark, P. O. New Boston, .	- -
Sandwich, . . .	314	John F. Carlton, P. O. Spring Hill, .	B. F. Denison.
Saugus, . . .	207	Ole C. Christiansen,	Thos. E. Berrett
Savoy, ¹ . . .	8	Herbert H. Fitzroy, P. O. Savoy Center.	- -
Scituate, . . .	291	John F. Turner, tree warden, . . .	Percival S. Brown.
Seekonk, . . .	267	John L. Barker, P. O. Attleborough, R. F. D. No. 4.	- -
Sharon, . . .	251	John G. Phillips,	T. J. Leary.
Sheffield, . . .	31	Geo. G. Peck,	- -
Shelburne, . . .	43	H. O. Fisk, P. O. Shelburne Falls, .	- -
Sherborn, . . .	203	Milo F. Campbell, constable, South Sherborn.	J. P. Dowse.
Shirley, . . .	168	Melvin W. Longley, assessor, . . .	A. A. Adams.
Shrewsbury, . . .	132	Wm. E. Rice,	Frank L. Ott.
Shutesbury, . . .	58	Emmons J. Spear,	- -
Somerset, . . .	336	James Wilson, fish and game warden,	- -
Somerville, ¹ . . .	-	- - -	Asa B. Pritchard.
South Hadley, . . .	78	Joseph Beach, P. O. South Hadley Falls.	- -
Southampton, . . .	76	Geo. W. Tyler,	- -
Southborough, . . .	337	Harry Burnett, tree warden, . . .	Harry Burnett.
Southbridge, . . .	109	Aimee Langevin, Olney Avenue, .	- -
Southwick, . . .	92	Edward Gillett, tree warden, . . .	- -
Spencer, . . .	121	A. F. Howlett,	- -
Springfield, . . .	86	Burton Steere, assistant fire chief, .	Wm. F. Gale.
Sterling, . . .	144	G. F. Herbert, assessor,	- -
Stockbridge, . . .	21	Geo. Schneyer, selectman, P. O. Gledale.	- -
Stoneham, . . .	190	Geo. E. Sturtevant, chief fire department.	Geo. M. Jefts.
Stoughton, . . .	258	Jesse E. Smith,	Wm. P. Kennedy.
Stow, . . .	183	William H. Parker, P. O. Gleasondale,	J. Frank Robbins.

¹ No forest area.

List of Forest Wardens and Local Moth Superintendents—Con.

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Sturbridge, . . .	108	Chas. M. Clark, P. O. Fiskdale, . . .	- -
Sudbury, . . .	185	F. E. Bent,	Wm. E. Baldwin.
Sunderland, . . .	338	A. C. Warner,	- -
Sutton, . . .	116	Ransom W. Richardson,	John E. Gifford.
Swampscott, . . .	339	Geo. P. Cahoon, fire chief department,	Geo. Newhall.
Swansea, . . .	273	Thos. L. Mason, constable, P. O. R. F. D. No. 2.	- -
Taunton, . . .	269	Fred A. Leonard, chief fire department, School Street.	Alvaro Harnden.
Templeton, . . .	107	Henry H. Seaver, P. O. Baldwinville,	John B. Wheeler.
Tewksbury, . . .	164	Herbert W. Pillsbury,	Harry M. Briggs.
Tisbury, . . .	310	Albert Rotch, P. O. Vineyard Haven,	- -
Tolland, . . .	90	Eugene M. Moore,	- -
Topsfield, . . .	218	Isaac B. Young, selectman,	C. W. Floyd.
Townsend, . . .	159	F. J. Piper, chief fire department, . . .	Geo. E. King.
Truro, . . .	324	Naylor Hatch,	Joseph H. Atwood.
Tyngsborough, . .	162	Otis L. Wright,	Howard E. Noble.
Tyringham, . . .	26	Geo. F. Knapp,	- -
Upton, . . .	126	Geo. Z. Williams, chief fire department,	Geo. H. Evans.
Uxbridge, . . .	113	Arnold S. Allen, constable and chief fire department.	- -
Wakefield, . . .	208	Samuel T. Parker,	W. W. Whittredge.
Wales, . . .	100	W. W. Eager,	- -
Walpole, . . .	340	N. Emmons Winslow, chief fire department.	Philip R. Allen.
Waltham, . . .	195	Geo. L. Johnson, chief fire department,	Jesse M. French.
Ware, . . .	75	L. S. Charbonneau, P. O. Box No. 25,	- -
Wareham, . . .	305	Arthur B. Savary,	J. J. Walsh.
Warren, . . .	119	Joseph St. George, constable,	Alfred A. Warriner.
Warwick, . . .	41	Chas. H. Williams,	- -
Washington, . . .	19	Geo. Messenger, R. F. D., Becket, . . .	- -
Watertown, . . .	206	John C. Ford, tree warden,	John C. Ford.
Wayland, . . .	196	Clarence S. Williams, Cochituate, . . .	Daniel Graham.
Webster, . . .	111	Arthur B. Patterson,	- -
Wellesley, . . .	239	Fletcher M. Abbott, tree warden, . . .	Fletcher M. Abbott.
Wellfleet, . . .	323	Edwin P. Cook,	Everett S. Jacobs.
Wendell, . . .	54	Geo. A. Lewis,	- -
Wenham, . . .	221	Jacob D. Barnes, tree warden,	Jacob D. Barnes.
West Boylston, . .	137	Frank H. Baldwin, agent Metropolitan Water Board.	- -
West Bridgewater,	285	Octave Belmore, tree warden,	Octave Belmore.
West Brookfield,	128	Robert M. Carter, P. O. Box 135.	- -

List of Forest Wardens and Local Moth Superintendents — Con.

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Westborough, .	133	James H. McDonald, chief fire department.	Walter Sullivan.
West Newbury, .	226	Silas M. Titcomb, P. O. Byfield, .	Robert J. Forsyth.
West Springfield, .	341	A. A. Sibley,	— —
West Stockbridge, .	20	Bernard Manning,	— —
West Tisbury, .	307	William J. Rotch,	— —
Westfield, . . .	84	Geo. H. Byers, chief fire department, P. O. address, Arnold Street.	— —
Westford, . . .	166	John A. Healey, P. O. Graniteville, .	Harry L. Nesmith.
Westhampton, .	71	Levi Burt,	— —
Westminster, .	154	John C. Goodridge, chief fire department.	Stillman Whitney.
Weston, . . .	186	Edward P. Ripley,	Edward P. Ripley.
Westport, . . .	279	Frank Whalon, North Westport, .	— —
Westwood, . . .	251	E. E. Smith, P. O. Islington, . . .	C. H. Southerland.
Weymouth, . . .	245	J. Rupert Walsh, P. O. East Weymouth.	Dummer Sewall.
Whately, . . .	56	James A. Wood,	— —
Whitman, . . .	297	Clarence A. Randall, tree warden, .	Clarence A. Randall.
Wilbraham, . . .	96	Henry I. Edson, P. O. North Wilbraham.	— —
Williamsburg, .	64	Howard C. Pomeroy,	— —
Williamstown, .	2	Daniel Hogan,	— —
Wilmington, . .	174	Jos. M. Hill, chief fire department, P. O. North Wilmington, P. O. Box 24.	Oliver A. McGrane.
Winchendon, . .	103	Arthur L. Brown, chief fire department.	— —
Winchester, . .	189	Irving L. Symmes, chief fire department.	Samuel S. Symmes.
Windsor, . . .	12	H. Ward Ford, tax collector, . . .	— —
Winthrop, ¹ . . .	—	— — —	Frank W. Tucker.
Woburn, . . .	177	Frank E. Tracy, chief fire department,	John H. McGann.
Worcester, . . .	131	H. Ward Moore, Winnefred Avenue, .	J. H. Hemingway.
Worthington, . .	62	Chas. E. Clark,	— —
Wrentham, . . .	260	Chas. E. Brown, chief fire department,	Wm. M. Gilmore.
Yarmouth, . . .	316	Seth Taylor, constable,	Chas. R. Bassett.

NEW LEGISLATION.

The new legislation enacted by the last General Court on forestry matters was as follows:—

1. An act relative to the liability of railroads for the extinguishment of forest fires.

2. An act empowering the Governor of the Commonwealth

¹ No forest area.

to issue a proclamation for a closed season for game during times of drouth.

3. Amended law, extending the area in one tract from 40 to 80 acres in lands purchased by the State for reforestation.

4. An act placing the work of suppressing the gypsy and brown-tail moths under the State Forester.

5. Appropriation for gypsy and brown-tail moth work.

6. An act to encourage the growth of white pine timber.

1. An Act relative to the Liability of Railroads for the Extinguishment of Forest Fires.

The enactment of this bill makes the railroads liable not only for the damage resulting from a fire caused by them, but for the expense of extinguishment of the fire. This act at first might seem to work hardship on railroads, as it was shown last year that 43 per cent. of the fires set in the State were railroad fires. With our new forest warden law, however, it is believed by both the State Forester and the railroad officials that with a perfected system of fire fighting the railroads themselves will gladly reimburse the towns and cities for the expense of extinguishing fires set by them, believing that by so doing the real damage to property will be thus lessened, and in the outcome not only will the railroads themselves be the gainers financially, but the towns and cities, in that less acreage is likely to be burned.

The act is as follows:—

ACTS OF 1909, CHAPTER 394.

AN ACT RELATIVE TO THE LIABILITY FOR THE EXTINGUISHMENT OF
FOREST FIRES.

Be it enacted, etc., as follows:

SECTION 1. Any railroad corporation which, by its servants or agents, negligently, or in violation of law, sets fire to grass lands or forest lands shall be liable to any city or town in which such fire occurs, for the reasonable and lawful expense incurred by such city or town in the extinguishment of the fire.

SECTION 2. Cities and towns may recover sums to which they are entitled under the provisions of this act by an action of contract in the superior court. [*Approved May 14, 1909.*]

2. *An Act empowering the Governor of the Commonwealth to issue a Proclamation for a Closed Season for Game in Times of Drouth.*

This is a precautionary measure that will result in calling the attention of the public to the importance of being careful about fires at a time when attention is most needed.

The act is as follows:—

ACTS OF 1909, CHAPTER 422.

AN ACT TO AUTHORIZE THE GOVERNOR TO PROCLAIM A CLOSE SEASON
FOR GAME IN TIMES OF DROUTH.

Be it enacted, etc., as follows:

SECTION 1. Whenever, during an open season for the hunting of any kind of game in this state, it shall appear to the governor that by reason of extreme drouth the use of firearms in the forest is liable to cause forest fires, he may, by proclamation, suspend the open season and make it a close season for the shooting of birds and wild animals of every kind for such time as he may designate, and may prohibit the discharge of firearms in or near forest land during the said time.

SECTION 2. During the time designated as above by the governor, all provisions of law relating to the close season shall be in force, and whoever violates any such provision shall be subject to the penalties prescribed therefor. In case any person shall, during a close season proclaimed as aforesaid, discharge a firearm in or near forest land, or shoot any wild animal or bird, as to which there is no close season otherwise provided by law, he shall be subject to a fine of not more than one hundred dollars.

SECTION 3. A proclamation issued under authority hereof shall be published in such newspapers of the state and posted in such places and in such manner as the governor may direct, under the charge and direction of the state forester and the commissioners on fisheries and game. [*Approved May 21, 1909.*]

3. *Revised Law extending the Area in One Tract from 40 to 80 Acres in Lands purchased by the State for Reforestation.*

The restriction to 40 acres was found to necessitate the expense of an extra survey where the lots ran slightly over the limited number, and by placing the area at 80 acres this objection is eliminated.

The act is as follows:—

ACTS OF 1909, CHAPTER 214.

AN ACT RELATIVE TO THE PURCHASE BY THE STATE FORESTER OF LAND
ADAPTED TO FOREST PRODUCTION.

Be it enacted, etc., as follows:

SECTION 1. Section one of chapter four hundred and seventy-eight of the acts of the year nineteen hundred and eight is hereby amended by striking out the words "forty acres", in the tenth line, and inserting in place thereof the words:— eighty acres,— so as to read as follows:— *Section 1.* For the purpose of experiment and illustration in forest management and for the purposes specified in section seven of this act the sum of five thousand dollars may be expended in the year nineteen hundred and eight, and the sum of ten thousand dollars annually thereafter, by the state forester, with the advice and consent of the governor and council, in purchasing lands situated within the commonwealth and adapted to forest production. The price of such land shall not exceed in any instance five dollars per acre, nor shall more than eighty acres be acquired in any one tract in any one year, except that a greater area may so be acquired if the land purchased directly affects a source or tributary of water supply in any city or town of the commonwealth. All lands acquired under the provisions of this act shall be conveyed to the commonwealth, and no lands shall be paid for nor shall any moneys be expended in improvements thereon until all instruments of conveyance and the title to be transferred thereby have been approved by the attorney-general and until such instruments have been executed and recorded.

SECTION 2. This act shall take effect upon its passage. [*Approved March 25, 1909.*]

4. *An Act placing the Work of suppressing the Gypsy and Brown-tail Moths under the State Forester.*

The enactment of this law was the result of its recommendation by Governor Draper in his inaugural address.

The act is as follows:—

ACTS OF 1909, CHAPTER 263.

AN ACT TO PROVIDE FOR CONSOLIDATING THE OFFICE OF SUPERINTENDENT FOR SUPPRESSING THE GYPSY AND BROWN TAIL MOTHS
AND THE DEPARTMENT OF THE STATE FORESTER.

Be it enacted, etc., as follows:

SECTION 1. Section one of chapter four hundred and nine of the acts of the year nineteen hundred and four, as amended by section one of chapter four hundred and seventy-three of the acts of the year

nineteen hundred and seven, is hereby further amended by striking out the said section and inserting in place thereof the following:—

Section 1. The governor, with the consent of the council, shall appoint an officer to be known as the state forester, and shall determine his salary. He shall be a trained forester who has had a technical education. He shall be ex officio a member of the state board of agriculture. He shall act for the commonwealth in suppressing the gypsy and brown tail moths as public nuisances. The governor may, with the consent of the council, remove the state forester at any time for such cause as he shall deem sufficient. In case of the death, removal or resignation of the state forester the governor shall forthwith appoint a successor.

SECTION 2. The office of superintendent for suppressing the gypsy and brown tail moths is hereby abolished. All the powers, rights, duties and liabilities of the said superintendent are hereby transferred to the state forester. No existing contracts, proceedings or liabilities shall be affected hereby, but the state forester shall in all respects and for all purposes be the lawful successor of the superintendent for suppressing the gypsy and brown tail moths.

SECTION 3. This act shall take effect upon its passage. [*Approved April 7, 1909.*]

5. *An Act to provide Funds for carrying on the Moth Work during a Definite Period of the Year, so that the Effect of the Work will not be handicapped.*

The act is as follows:—

ACTS OF 1909, CHAPTER 452.

AN ACT TO PROVIDE FOR THE SUPPRESSION OF THE GYPSY AND BROWN
TAIL MOTHS.

Be it enacted, etc., as follows:

SECTION 1. The state forester is hereby authorized to expend for the suppression of the gypsy and brown tail moths, and for expenses incidental thereto, the sum of one hundred and fifty thousand dollars annually for three years, beginning with the year nineteen hundred and ten; and if any part of the said one hundred and fifty thousand dollars remains unexpended at the close of any year the balance may be expended in the following year.

SECTION 2. This act shall take effect upon its passage. [*Approved May 26, 1909.*]

6. *An Act to encourage the Growth of White Pine Timber.*

This bill was enacted in order to encourage land owners to leave seed trees and encourage natural methods of reforestation.

It offers as a premium exemption from taxation for a certain period of all lands that are properly restocked to white pine.

ACTS OF 1909, CHAPTER 187.

AN ACT TO ENCOURAGE THE GROWTH OF WHITE PINE TIMBER.

Be it enacted, etc., as follows:

SECTION 1. Land which does not exceed in value ten dollars an acre, if well stocked with thrifty white pine seedlings that have attained an average height of not less than fifteen inches, upon satisfactory proof of its condition by the owner to the assessors, shall be exempt from taxation for a period of ten years thereafter: *provided*, that if any trees of commercial value, except such as are reasonably removed for the improvement of the white pine growth, are cut or removed from the said land, the exemption herein provided for shall cease.

SECTION 2. All acts and parts of acts inconsistent herewith are hereby repealed.

SECTION 3. This act shall take effect upon its passage. [*Approved March 18, 1909.*]

ACKNOWLEDGMENTS.

It is with pleasure that the State Forester acknowledges the valuable services and loyal support which he has received through his corps of assistants, not only in the office but in the field, throughout the year.

Mr. L. Howard Worthley has been untiring in his efforts to leave nothing undone in his assistance in perfecting the organization of the moth work and in getting the best possible results.

Mr. H. O. Cook, M.F., has kept up the high standard in technological lines, and, as the reports show, has increased the efficiency of the work in forestry management beyond that of any previous year.

Mr. R. S. Langdell, who has charge of the nursery work, has not only demonstrated that this work is a commercial success, but has penetrated every section of the State, and is largely responsible for the splendid beginning already made in reforestation.

Mr. Chas. O. Bailey has loyally stood at his post of duty as secretary, and kept the machinery well oiled and properly running.

The State Forester is under obligation, for courteous treatment and kindly consideration, to all citizens, boards and officials with whom he has come in contact, and especially to Dean W. C. Sabine of Harvard University, Dr. L. O. Howard of the United States Bureau of Entomology, and his predecessor, A. H. Kirkland, for kindly assistance, suggestions and advice. He wishes also to acknowledge the great assistance rendered by the men of the co-operative scientific staff.

PART I.

GENERAL FORESTRY.

PART I.

GENERAL FORESTRY.

EXAMINATION OF WOODLANDS AND PRACTICAL ASSISTANCE GIVEN OWNERS.

This department of our forestry work is the largest establishment of all our lines, yet it is not as familiar to the people of the State as it should be. If it were, we believe that there would be many more calls for advice than we receive at present. By examinations we refer briefly to this, that owners of woodland in the State may, by applying to this office on a special blank, have a trained forester come and look over their woodland, and he will point out to them how it can be improved, and furnish any other information which it is in his power to give. Where it is a case of thinning, he may, if he sees fit, mark a portion of the trees to be cut. The only expense to the owner for this advice is the travelling expenses of the visiting forester. This offer applies equally to land owners who want advice on the planting of barren land. Counsel given on the ground, where all the conditions can be seen and met, is far superior to any given by correspondence or to the general advice contained in pamphlets.

The following table shows the number of examinations made in this and past years, together with the combined area of the various wood lots. It will be noticed that there is a slight falling off since last year; but this fact does not discourage us, because in 1908 we made a special effort to advertise this part of our work, first by sending out a large number of examination application blanks to those on our mailing list, and second, by sending a special circular letter to all the water boards in the State. The result was, of course, that quite a number of requests for assistance were received which otherwise would not have been made, including some of our largest. Holding that the figures of last year were abnormal, we consider those of this

year to be distinctly encouraging; yet, as we have said before, we think that there should be more use made of this offer on the part of the State of free forestry advice.

	1904. (6 mos.)	1905.	1906.	1907.	1908.	1909.
Number,	14	36	47	37	65	60
Total area,	2,000	6,545	9,357	8,713	15,842	15,862

As was done last year, a circular letter with an accompanying set of questions was sent to those who received advice during 1908, the object of which was to ascertain how far the recommendations made by the visiting forester had been carried out. A larger percentage of replies was received than last year, there being 46 who sent in reports, to 12 who did not. Eight were not given blanks, as enough was known of their work, through other channels, to make further information unnecessary. The following table gives a summary of these reports:—

REPORTS RECEIVED FROM EXAMINERS OF 1908.

Recommended to thin:—

All the work done,	8
Partly done,	13
Nothing done,	10

Recommended to plant:—

All the work done,	2
Partly done,	13
Nothing done,	15
Recommended to do nothing,	4
Clean cutting recommended,	2

RESULTS OF EXAMINATIONS OF 1907.

Recommended to thin:—

All the work done,	3
Partly done,	6
Nothing done, or not reporting,	8

Recommended to plant:—

All the work done,	2
Partly done,	10
Nothing done, or not reporting,	8
Recommended to do nothing,	4



A white pine plantation on the watershed of the Wachusett reservoir, near Clinton.



A mixed white pine and hard-wood plantation, five years after setting. The hard woods are not a success.

Contrary to results in 1907, thinning work in 1908 seemed to be more popular than planting. This may be due in part to the fact that we have endeavored to mark a portion of the trees to be cut.

For a record of the work done, see list under forestry expenditures and receipts.

REFORESTATION WORK.

Great interest has been shown in regard to reforesting the waste and denuded lands of the Commonwealth. The reforestation law of 1908 fills to a large extent a long-felt want in this line of work, and, although the State planting is necessarily limited by the appropriation, it is desired as far as possible to plant one or more lots in each town in the State. This will place before the people an example which private owners can follow out in their own work, and in time bring much of the lands generally considered worthless and an eyesore to the community back into a profitable forest growth.

Land referred to as fit only for reforesting purposes can be classed under the following types: cut-over land, burnt-over land, and run-out pasture land (growing up to gray birch, etc.). The land taken over under this act generally comes under one of the foregoing types.

The first of the year a notice and copy of the acts were sent to the selectmen, forest warden and the leading newspapers in each town. From applications desiring to take advantage of the act, deeds for 929 acres of land have been recorded and the tracts planted last spring. For this purpose 500,000 three-year-old white pine transplants were obtained from German nurseries, and as many more seedlings from this country, a portion of the latter being sent out from the State nursery at Amherst.

The different lots were planted by local workmen in the towns, under the supervision of experienced foresters from this office. The average cost of planting this year ranges from \$6 to \$10 per acre; but by raising our own trees in a nursery established for the purpose the cost could be greatly reduced.

In a few instances it was deemed advisable to cut a fire belt on the exposed side of the plantation, to act as a protection from

forest fires, which are the chief danger and drawback to setting out trees to be grown for a term of years.

The coming year land in other sections will be planted, and it is hoped plantations will become quite generally distributed throughout the State.

The following plantations were made in the towns named during the past year:—

STATE PLANTATIONS.

Town.	Acres	Type of Land.	Variety planted.
Andover, . . .	40	Cut and burnt land, . . .	White pine.
Ashburnham, . . .	66	Run-out pasture . . .	White pine.
Ashburnham, . . .	10	Run-out fields, . . .	White pine.
Ashburnham, . . .	5	Old orchard, . . .	White pine.
Carver, . . .	5	Burnt-over land, . . .	White pine.
Gardner, . . .	93	Burnt-over land, . . .	White pine.
Hubbardston, . . .	54	Sandy plain land, . . .	White pine.
Hubbardston, . . .	40	Plains land, . . .	White pine.
Hubbardston, . . .	40	Cut and burnt land, . . .	White pine.
Hubbardston, . . .	14	Cut-over land, . . .	White pine.
Hubbardston, . . .	10	Cut-over land, . . .	White pine.
Kingston, . . .	10	Burnt-over land, . . .	White pine.
Montague, . . .	26 ¹	Plains land, . . .	White pine.
Paxton, . . .	55	Cut-over land, . . .	White pine.
Pelham, . . .	16	Cut-over hillside, . . .	White pine.
Pelham, . . .	6	Cut-over land, . . .	White pine.
Rowley, . . .	10	Cut-over land, . . .	White pine.
Sandwich, . . .	14	Cut-over land, . . .	Scotch and Austrian pine.
Spencer, . . .	35	Cut and burnt land, . . .	White pine.
Spencer, . . .	23	Run-out pasture, . . .	White pine.
Spencer, . . .	6	Cut-over land, . . .	White pine.
Templeton, . . .	107 ¹	Cut-over land, . . .	White pine.
Templeton, . . .	60 ¹	Cut-over land, . . .	White pine.
Westminster, . . .	40	Cut-over land, . . .	White pine.
Westminster, . . .	40	Cut-over land, . . .	White pine.
Westminster, . . .	39	Burnt-over land, . . .	White pine.
Westminster, . . .	36	Cut-over land, . . .	White pine.
Westminster, . . .	29	Cut-over land, . . .	White pine.
Total area, . . .	927		

¹ Lots protected by fire belt.

PLANTING DONE UNDER ADVICE OF STATE FORESTER.

NAME.	Town.	Variety.	No. of Trees.
Amherst Water Company,	Amherst,	White pine, . .	10,000
Holyoke Water Company,	Holyoke,	White pine, . .	10,000
Leominster Water Company,	Leominster,	White pine, . .	7,000
Westfield Water Company,	Westfield,	White pine, . .	7,000
Harlow Brook Cranberry Company,	Wareham,	White pine, . .	5,000
Fred Barclay,	Spencer,	White pine, . .	12,000
Lewis I. Wright,	Gardner,	White pine, . .	2,000
E. E. Rice,	Boston,	White pine, . .	1,000
D. H. Rice,	Barre,	White pine, . .	2,000
N. D. Bill,	Springfield,	Chestnut, . .	500
E. P. Dunbar,	West Bridgewater,	White pine, . .	4,000
A. H. Hall,	Leominster,	White pine, . .	1,000
Brown Bros. and John Folsom,	Winchendon,	White pine, . .	50,000

EVERGREEN SEEDLINGS NOW IMPORTED FREE OF DUTY.

It may be of interest to know that the last session of Congress removed the duty on evergreen seedlings. This places the reforestation work with evergreens on a practical basis. Our people will ultimately grow their own stock, and the foreign importation will keep prices within bounds until that time. The tariff heretofore was \$1 per 1,000, and 15 per cent. ad valorem.

FOREST NURSERY.

The State forest nursery at Amherst on the farm of the Agricultural College was again enlarged last spring, and we have prospects of being able to use at least 1,200,000 white pine two-year-old trees of our own growing in the reforestation work throughout the State next spring. Besides white pine we also have many other species in lesser lots, but all of value in the State work. The detailed table which follows may be of interest. The State forest nursery work speaks for itself, when we show that the total expense of carrying it on has been for three years \$5,749.69, and were we to sell the stock now on hand at current prices it would be worth \$7,500.

Meanwhile, we have been using seedlings and transplants

every year which are not included here. Last spring alone we dug from the nursery at least 150,000 trees, and at present we have fully 2,000,000 one-year-old white pine seedlings, besides 100,000 of other species. The following table shows the estimated amount of nursery stock on hand:—

VARIETY.	Age (Years).	No. of Trees.
White pine seedlings,	2	1,200,000
White pine seedlings,	1	2,000,000
Pitch pine seedlings,	2	40,000
Pitch pine seedlings,	1	50,000
Norway pine seedlings,	1	5,000
Austrian pine seedlings,	1	2,000
Norway spruce seedlings,	1	25,000
Balsam fir seedlings,	1	5,000
Hemlock seedlings,	1	5,000
Red spruce seedlings,	1	2,000
Black locust seedlings,	1	5,000
Total,		3,339,000
White pine transplants,	4	25,000
White pine transplants,	3	25,000
White ash transplants,	2	20,000
Norway spruce transplants,	3	3,000
Black locust transplants,	2	2,000
Catalpa speciosa transplants,	2	300
Honey locust transplants,	2	6,000
Total,		81,300

It has been the aim of the State Forester not only to demonstrate in the nursery what can be done, but to assist those interested in growing their own trees by sending literature describing how to collect the seed, and even furnishing an assistant to demonstrate how to make the seed beds and plant the seeds. During the planting season at the nursery we are glad to welcome any one desiring experience in nursery work. This offers an opportunity not only to see how the work is performed, but to get some actual experience. Last spring several persons availed themselves of this offer.

A few persons have started seed beds of their own. One man will have 150,000 two-year-old seedlings to use from his own growing next spring, while another estimates he will have from 250,000 to 350,000. Many more will have smaller lots.

Larger State Nursery needed.

The time has come when the State should have a more definite forest nursery policy. It is deemed practically necessary that the State operate a nursery of sufficient size to raise its own trees for reforestation purposes under the reforestation act. It is believed the State Forester will be unable to secure sufficient suitable land in large enough area on the farm of the Agricultural College to carry on the work necessary. The college already feels cramped for land, and the small tract used for the present nursery, which is altogether inadequate for the needs of the coming year, is allowed us only temporarily. If the college trustees feel unable to allow the State Forester double the area where the present nursery is located, it will necessitate making plans elsewhere. A water supply should be put in, more screens made and a better work shed built. The nursery should also be fenced off, as damage has repeatedly resulted from animals getting loose and trampling the beds. These improvements will be necessary, whether we remain at the college or move the nursery elsewhere.

The State Forester should be given sufficient funds for establishing a nursery commensurate with the carrying out of the reforestation act, for, as already demonstrated, it amounts only to lending the money to carry on work that will be returned to the State treasury later in the sale of forest products.

New York State last year published a bulletin offering forest tree seedlings and transplants from the State forest nursery to any one who would guarantee to plant them in that State, at the following prices: —

White pine transplants,	\$4.25 per 1,000, f.o.b.
White pine seedlings (2 years old),	2.25 per 1,000, f.o.b.
Scotch pine transplants,	3.75 per 1,000, f.o.b.
Scotch pine seedlings,	2.25 per 1,000, f.o.b.

While the State of New York was encouraging its people in reforestation by the above generous offer, Massachusetts was unable to purchase similar white pine seedlings for less than \$4 per 1,000 in this country, and even at that price we were compelled to take them in 100,000 lots; for 1,000 lots the price was \$5 per 1,000 for the best and \$4 for second quality. Transplants of white pine were quoted at from \$10 to \$20 per 1,000.

If New York can do this, and make the work self-supporting, I feel sure that under similar conditions Massachusetts can do as well.

As was stated last year, it is not the intention of the State to go into the nursery business, other than to meet requirements in carrying out a practical economic reforestation policy. If we can grow seedlings and pay all expenses for \$2.25 per 1,000, why should we be compelled to pay \$5? Using, as we will the coming spring in the State reforestation work, 2,000,000, the cost if grown by ourselves would not exceed \$4,500, while in the American markets they would cost us \$8,000 if purchased in large lots, or \$10,000 if purchased in smaller quantities.

While the difference in white pine seedlings seems large, transplants are comparatively more expensive, the one being \$4.25 per 1,000 as compared to \$12.

NORWAY SPRUCE AS A FOREST TREE.

This tree is used quite commonly as an ornamental tree in this State, and common observation shows that it succeeds remarkably well. As a possible forest tree it has not been considered very seriously until this year. It is believed that the Norway spruce will succeed where our native spruces are found growing naturally, and perhaps elsewhere. The following experience of Mr. George Aiken, manager of the Billings Farm at Woodstock, Vt., in growing Norway spruce on his farm, is herewith offered, with his permission.

One acre was planted with three-year-old trees, 8 feet apart each way, requiring 680 trees to the acre. The land was a poor, sandy hillside, unfit for cultivation. In 1908, when the trees were thirty-two years of age, or thirty-five years from seed, 4 average-sized trees were cut. Their measurements were as follows: —



A large tract of land in Hubbardston, which was reforested by the department last spring.



A portion of one of the lots turned over to the State. The cord wood taken out pays the expense, and the remaining stand is in a much-improved condition.

- No. 1, 72 feet high, 11-inch butt cut, $46\frac{1}{2}$ feet of logs 6 inches at top.
No. 2, 57 feet high, 15-inch butt cut, $47\frac{1}{2}$ feet of logs 6 inches at top.
No. 3, 63 feet high, 14-inch butt cut, 42 feet of logs 6 inches at top.
No. 4, 67 feet high, 16-inch butt cut, 40 feet of logs 6 inches at top.

These 4 trees produced 1 cord of pulp wood. Reckoning from this yield as applied to an acre, the yield would be $172\frac{1}{2}$ cords, which at the current price of \$6.50 per cord, would give the income from this acre \$1,120 in thirty-two years.

Computing the land at \$5 per acre, cost of trees and planting at \$5, and to this adding compound interest for the thirty-two years, the total would amount to \$65.50; adding to this taxes for thirty-two years, or \$7.50, makes the total investment \$73, and hence leaves a net income of \$1,046.86, or a yearly average of \$36.72 per acre. Mr. Aiken claims that this land is not worth over 50 cents per acre per annum for grazing.

The pulp wood cut here was sold to the International Paper Company, who made it into paper at the Bellows Falls mill. Mr. Edward Barrett, superintendent of this mill, reports as follows:—

The Norway Spruce Test.—One cord of rough wood, 71 sticks 4 feet long, after preparing for grinding room, gave us 98 cubic feet; this made 1,228 pounds of dry wood pulp. The spruce worked nicely on the paper machine, and, under the same conditions as our regular spruce, gave us a higher test for strength and a brighter shade with the same amount of color.

For the first time the State Forester expects to set out quite a large number of Norway spruce in Massachusetts the coming spring. The beauty of the spruce for pulp wood is that practically the whole tree is utilized.

FOREST FIRES OF 1909.

Forest fires have been altogether too numerous throughout the State during the past season. We are convinced that the permit act which went into effect last spring gave splendid results, and that forest wardens generally were more active than ever; but with all this we are not accomplishing the results we should and must.

The total number of forest and grass fires reported to the State Forester during the year was 1,531; the number of acres burned over, 42,808; loss to the State, \$236,478.

From the table it is shown that the chief cause of forest fires is from railroad locomotives, which set 497, or 34 per cent. of the total of the year, compared with 490 last year. Next in point of number are fires from unknown causes, 360. The third largest cause is due to burning brush, 108, or 7½ per cent. of the total. The fourth in number is that caused by smokers, 90. It is believed, however, that in the latter should be included the great number of those listed under the unknown, and even some of those attributed to other causes. The fifth cause was directly traceable to our juvenile population, as 83 were known to be set by boys.

It is hoped that our railroads will exert themselves to lessen these fires in the coming year. We certainly should ascertain the causes unknown at present, and, with our permit law in force, the burning brush cases should be very much reduced; while the number of fires caused by smokers and boys will be overcome only by a determination to place the responsibility where it belongs by our forest wardens, deputies and people generally interested in preserving our forests.

Fires from Smoking.

That the careless smoker, who persists in the habit when in woodlands or traversing the country during a dry time, whether at work or play, is the greatest menace to future forestry, it is believed there is little question. The railroad fires are confined to certain areas, but the smoker is everywhere. If forest wardens or their deputies were to bring more circumstantial evidence to bear against smokers from known locations where hunters, fishermen, campers, woodsmen, etc., have traversed, it is believed the effect of the law which makes such persons liable for damages would prove helpful to future forestry.

CAUSES OF FOREST FIRES IN MASSACHUSETTS, 1909.

CAUSES.	No.	Per Cent.
Berry pickers,	25	1.72
Blasting fuse,	1	—
Boys set fire,	83	5.72
Burning brush,	108	7.51
Campers,	9	—
Carelessness,	2	—
Charcoal,	1	—
Children playing,	9	—
Coals dumped,	5	—
Cranberry bogs,	1	—
Electric wires,	2	—
Fire balloons,	1	—
Fireworks and fire crackers,	4	—
Fishermen,	2	—
Grass fires,	30	2.06
Gypsy moth,	6	—
Hunters,	8	—
Incendiary,	36	2.48
Lightning,	1	—
Locomotive sparks,	497	34.26
Mayflower parties,	2	—
Picnic parties,	2	—
Rubbish fires,	31	2.13
Smokers,	90	6.20
Steam saw mills,	5	—
Spark from burning building,	6	—
Spark from forest fire,	11	0.76
Steam roller,	3	—
Scattering,	106	7.33
Unknown,	360	24.89
Wood choppers,	3	—
Reported too late for tabulating,	63	—
Total,	1,513	—

Arrests and Convictions.

Forest wardens have been extremely lenient as regards arrests for violations of the State forest fire laws, — altogether too much so, it is believed. The idea has been to caution people

and educate them in realizing the danger of forest fires before arresting them. It is believed, however, that we have been generous in this respect, and henceforth if we are to stop fires we must be reasonable, but assert a little more backbone in controlling them.

The following arrests and convictions were made during the year 1909:—

Edgartown, July 12. Conviction of man taken while burning without a permit; case placed on file.

Falmouth, June 1. Young man convicted of setting woods fire, and sent to reformatory.

Holbrook, December. Conviction of man burning without a permit; paid fine and costs.

Lancaster, April 2. Man taken while burning without a permit; paid costs and damages.

Mansfield, March 30. Tramp convicted of setting fire to farmer's wood lot; sent to jail.

Plymouth, August 8. Man convicted of burning without a permit; fined \$10.

Reading, October 13. Two men burning without permit; fined \$25 each.

Spencer, April 10. Man burning without permit; fined \$10.

Stoughton, April 7. Man burning without permit; fined.

Tewksbury, July. Boys placed on probation.

Upton. Two men arrested; placed on probation.

Wrentham. Cases on file.

TABLE OF ACRES, COST AND DAMAGE, BY MONTHS.

MONTHS.	Acres.	Cost.	Damage.	Damage per Acre.
January,	13	—	\$20	—
February,	12	—	—	—
March,	1,577	\$684	4,763	\$3.02
April,	12,515	2,866	72,195	5.76
May,	4,322	1,588	38,080	8.81
June,	405	242	11,870	29.30
July,	11,992	2,715	26,396	2.20
August,	1,940	2,745	10,833	5.57
September,	1,092	562	21,413	19.51
October,	384	180	1,805	5.17
November,	585	356	612	0.61

TABLE OF FOREST FIRE TOTALS.

	No. of Fires.	Acres burned.	Cost to put out.	Damage.
Reports received too late for tabulation, .	63	246	\$110	\$1,515
Totals of reports tabulated for 1909, .	1,450	42,562	15,433	219,425
Forest fire totals for 1909, .	1,513	42,808	\$15,543	\$220,930

RAILROAD CO-OPERATION IN FOREST FIRE FIGHTING.

During the last year, as heretofore, the officials of the railroads have for the most part shown a very helpful and co-operative spirit in regard to forest fires. More attention has been given to keeping the spark-arresters on engines in order, while our forest wardens and the section men are working together for the prevention of fires. The new legislation of last year, whereby the railroads are to reimburse the towns for the cost of fighting fires known to be set by them, was enacted without any protest, and, in fact, with their consent. Hereby an organization for forest fire fighting is resulting which will prevent fires that otherwise would be of great expense to railroads. The damages for one fire are likely to cost a railroad more than the total expense of reimbursing all of its towns in fighting fires set by them.

President Tuttle of the Boston & Maine Railroad complimented us by having a representative at both the Northampton and Boston conferences of forest wardens, who discussed "What the railroads are doing to prevent fires," and pointed out wherein they were glad to co-operate with the towns in stopping forest and grass fires. The New York, New Haven & Hartford Railroad also sent a representative to the Middleborough meeting in a like capacity. Mr. Louville Curtis, the representative of the Boston & Maine Railroad, has already adopted the use of hand fire extinguishers on the western division of their road, and is delighted with the results. He believes that their use will become very common by railroads for extinguishing forest or grass fires in the future. They could be kept at points along the line easy of access, and quickly shipped by the first train or sent by a special if occasion demanded. Much clearing up

and widening of the right of way have been done by the New York, New Haven & Hartford Railroad throughout the year, particularly in the Cape section.

FOREST FIRE DEPUTIES NEEDED.

The forest warden law has undoubtedly been tested far enough to be pronounced a success as another step in perfecting our organized efforts against forest fires. I now propose the idea of empowering the State Forester to appoint deputies at large to assist him. Many of our forest wardens need instruction and co-operation in getting their work well in hand. The best way to teach these men just how to accomplish results in fighting forest fires is to confer with them right on the ground, and demonstrate what can be accomplished and how it can be done. There are experienced men whom the State Forester could in times of emergency delegate to assist, and, if need be, with authority to take charge.

In the case of the gypsy and brown-tail moth agents, these men are at present mounted on motor cycles and hence are familiar with the country. They are already State employees, and men interested in the preservation of the forests. They will gladly acquaint themselves with modern methods of fighting forest fires, and, were they appointed deputies authorized to assume responsibility, the State would have their services at no extra compensation. Of course this would apply only throughout the moth-infested territory, but other plans could be worked out for the remainder of the State at a minimum cost.

STATE SUBSIDY TO TOWNS FOR BETTER FOREST FIRE PROTECTION.

The time has come when we can ill afford to allow forest fires to run rampant over the State, destroying each year thousands of dollars worth of property.

In many cases the reason for present conditions is that a great many of our rural towns have nothing in the way of equipment with which to fight forest fires when they occur. With a simple equipment, consisting of a few hand chemical fire extinguishers provided with extra charges and loaded into a light one-horse



A photograph, taken after the fire, of a portion of the ten thousand acres burned at Bourne and Falmouth.



The plowed fire line along an old road, which enabled Sandwich to protect the town from the Bourne fire. Bourne on the left, Sandwich on the right.

spring wagon, together with some shovels and hoes, many of the fires could be easily handled before they could do much damage.

Believing, therefore, that the State can afford to encourage the towns to make a definite beginning in stopping forest fires, I recommend the following for your consideration: that the State offer through the State Forester to reimburse towns 50 per cent. of their expenditures for forest fire fighting equipment, or in making forest fire protective belts, to an amount not to exceed \$250 for each town thus accepting such aid.

This idea is practically that now in operation by the State in the construction of our State highways, which has proved a great success. The incentive for towns that would otherwise move slowly is apparent.

The total expense, were every town to accept, would amount to but \$80,250, — not one-third of the annual loss from forest fires, and with every possibility of the expenditure meaning a saving of ultimate millions in future values to the State.

PLAN FOR ESTABLISHING FOREST FIRE LOOKOUTS.

This plan provides for the erection of lookout towers on various high points throughout the State, with the object of detecting and locating forest fires while yet in an incipient stage. The plan is by no means a new one, even in this State, as is evidenced by the towers already in use in Plymouth and Duxbury, and described in the recent fire bulletin issued by this office; while it is generally conceded that the system of towers used by the large timber operators in Maine is one of their most valued assets, since it affords means of preventing fires which would otherwise destroy millions of feet of valuable timber.

But, while the principle and the results are thus similar, the method of application in Massachusetts must necessarily differ greatly from that in Maine. This is because of the different physical conditions of the two States, as we may say; for, while the forest regions of Maine are practically in the central and northern part of the State, and often lie for miles in unbroken tracts, in Massachusetts there are no real forests, properly so-called, and the tracts of woodland that do exist are scattered

over all parts of the Commonwealth, from Cape Cod to the Berkshires, and occur under widely different topographical conditions. And, furthermore, such systems of lookouts as we have mentioned are managed over comparatively localized areas, usually vast wildernesses, by the owners themselves for their own benefit, while the difference in Massachusetts is obvious.

The problem is not to immediately establish a complete fire protection system all over the State, but to endeavor, by placing lookouts at certain important points, to co-operate as far as possible with the local wardens in the quick detection of fires. It is easily seen that such a system becomes useful largely in proportion to the distance covered from a given point, so that a tower erected on flat country may prove of great service. Take, for example, the Plymouth tower. This tower was built by the town of Plymouth, and is of skeleton steel construction somewhat like a windmill tower, with a small sheet-iron cabin at the top. The structure itself is 85 feet high, and the watchman is elevated 250 feet above sea level, — an elevation which enables him to see many miles over the surrounding flat country. A man is kept on watch in this tower in dry seasons from March 15 to October 1, from 8 in the morning till 6 at night. This watchman is connected by telephone with the forest warden, and the plan has proved to be a most excellent one.

The Cape has by far the most destructive fires of any region in the State, and it is therefore thought advisable to lay the strongest emphasis on that section at present, at the same time choosing suitable locations in other sections. At least two towers are urged for the Cape section.

One of the necessary equipments of such stations is the telephone, and the cost of installation would depend, first on whether such hills were already equipped (as is Mt. Greylock); and, second, on the distance to the nearest line and likelihood of future development in the vicinity, which would affect the cost of putting in such a line. In the more remote localities a larger proportion of the expense would have to be borne by the State.

Other equipment consists of good field glasses, range finder and accurate maps of the region. The cost of the structure itself depends, of course, on the locality and the amount of con-

struction necessary. Of 22 stations in Maine, the cost runs anywhere from \$350 to \$1,000, depending largely on the length of telephone connection. Telephone lines have cost there from \$30 to \$40 a mile.

One of the large lumber companies owning timber lands in Maine recommends a number of extinguishers on hand at the watch tower for use in case of emergency, and also the maintenance of a patrol during especially dry times.

As regards the expense of maintenance, it seems only fair that it should be borne in part at least by the towns to which protection is given.

ASSISTANT NEEDED IN FOREST FIRE WORK.

The time has come when the State Forester should have the assistance of a man who can spend his whole time on forest fire work. For the next few years each town should be visited, and the whole matter of forest fire prevention gone over carefully with the local wardens. Your State Forester cannot get over each of our 321 towns and give them the attention they should have regarding forest fires, and at the same time keep the reforestation, moth work, lectures, correspondence, etc., going. With a competent assistant, however, he can direct the work, and save great values that each year at present are a total loss. Such an assistant could be provided with a motor cycle, by means of which even the most inaccessible country sections could be easily reached. The idea would be to keep this man in the field, particularly during the forest fire season. The expenses of such a man would be his salary and travelling expenses.

POWER SPRAYERS AS FOREST FIRE EQUIPMENT.

With the high-power engines and improved pumps on the modern power sprayers, we have an outfit not only adapted to spraying our tallest trees in moth-suppression work, but when properly handled they can be used very effectively for fighting forest fires. While these outfits are rather heavy when loaded, and need a strong team to handle them on the ordinary roads, they may need four horses when operating in woodlands. The advantages of these machines are that they contain a large tank

for water, and also that their power is sufficient so that hose one thousand feet or more in length can be used. In cases where the machines can be placed at the water supply, they can pump directly to the fire.

The following quotation is taken from a letter written to H. L. Frost & Co. by Mr. J. D. Barnes, local superintendent and forest warden, Wenham, Mass.:—

I also put the machine to a good fire test. Of course we did not purchase this outfit for a fire fighter, but we happened to have a large fire here, where nine ice houses were burning at once. Now, there was a forest across the road from these buildings, also a group of four cottages. I started to save the forest land, not thinking I could do anything about the cottages, but to my surprise we stopped the forest fires and saved the cottages. I started the machine at 4 P.M. and played until 3 A.M., and then started at 7 A.M. and played all day except the noon hour, using two streams of 500 feet of 1-inch hose each, drafting and playing direct. I had to remove the plug in the bottom of the tank to get rid of surplus water, which gained about 400 gallons every forty minutes, which the nozzles could not take care of.

AUTOMOBILES AND MOTOR CYCLES IN FORESTRY WORK.

Upon assuming the duties of the moth work, it was found that the expenditure of a large amount of money in automobile hire would be necessary, as this is the only expedient way of getting into the infested districts and keeping in touch with the field work. It was found that this expense during the previous year had been over \$2,000. The matter was taken up with Governor Draper, and he authorized the purchase of an automobile, which has been in constant use. When controversies have arisen in towns or cities over the conditions of the work, we have been able to take the board of selectmen, mayors and others interested directly into the field. It has not been uncommon for the automobile to cover from 10 to 20 towns in a single day, and to do business with as many local superintendents.

The motor cycles were purchased by the department for the division superintendents, and were first used in September. From this short experience we are convinced that the efficiency of each man is greatly multiplied. With a motor cycle he can if need be get into every town under his supervision in one day.

Two motor cycles have also been purchased for the use of the forestry assistants.

I predict even farther that it is only a matter of a short time before our towns will be able to combat forest fires through the assistance of automobiles. Already some of our public-spirited forest wardens have automobiles of their own, and they do not hesitate to use them as occasion demands. They reach the fire quickly, and thus accomplish results when other means of conveyance would be too late.

FIRE BALLOONS.

A few complaints have reached the State Forester claiming that the so-called toy paper or hot-air balloons have been responsible for starting forest fires, and their use should be regulated. It can be readily seen that where the conditions are just right the damage from this source might be very serious. It is recommended, therefore, that in order to fly these balloons the participant be required to secure a permit from a forest warden, and that the liability for damages should they occur be the same as for other fires set out of doors.

PRICE TO PAY FOR FIGHTING FOREST FIRES IN TOWNS.

There seems to be no uniformity in towns regarding the price per hour paid for fighting forest fires. One town may pay 15 cents an hour and another 50 cents, while others range between these two extremes. At the various conferences of forest wardens held the past fall this question was brought up, and it was the consensus of opinion that a uniform rate should be adopted for the entire State. This question, however, is a local one; and, while 15 cents may not be enough, 50 cents seems high, and it is believed that the town forest warden should have the matter adjusted at the town meeting to meet his needs. One forest warden has an arrangement with his town chief of the fire department, whereby he can have experienced firemen at the rate of 50 cents for the first hour and 25 cents for each succeeding hour. A few live men who are willing and interested in the town's future welfare, with some up-to-date equipment, are worth much more than a large number of unorganized men, as frequently found at forest fires.

SLASHINGS OR BRUSH SHOULD BE BURNED.

The common custom of allowing the slashings to remain upon the ground after lumbering operations leaves a veritable tinder box for forest fires. A fire once started here is soon beyond control, and the damage is not confined even to the area covered with slashings, but in most cases adjoining properties are endangered and frequently large areas are devastated. With forest products at present prices and the facts well understood that fires are the great menace to future forestry, it is time that we should enact laws regulating the handling of slashings.

The United States Forest Service requires that the brush resulting from lumbering operations upon the forest reserves be piled and burned as a part of any contract they let. Wisconsin has a special commission appointed by the Legislature to report recommendations toward regulating this matter.

There are few States that need to give attention to this subject more than Massachusetts. We are thickly populated, and the damages from fires are relatively great. Our markets are of the best, and as a matter of business we can ill afford to practice a slack policy.

If when operating our forest or wood lots the brush is made at the time into small piles, they can be burned at a time when there is no danger from spreading. It is advisable to burn the slashings when operating, if conditions are favorable, as they are then green; and, as the work is usually done during the winter season, there is snow on the ground, or sufficient moisture is present to prevent any spreading of the fire.

With the slashings and general debris out of the way, the fire danger is reduced to a minimum; and, whether the land is reforested by setting out seedlings or a copse growth established, the conditions for future success will be of the best.

FIRE LINES AND PROTECTIVE MOTH BELTS.

It is a common practice in the gypsy moth work to surround badly infested colonies that otherwise would spread by making protective belts of 50 to 100 feet wide, and by thinning out the stand and opening up an avenue whereby the insects cannot pass



A fifty-foot fire lane to protect the plantation on the left. In the center of the picture and at the inner edge of the fire lane is a six-foot trench, made with mattocks and shovels by taking off the turf which surrounds the planting. Burning brush in separate piles, when the snow is on the ground, to avoid forest fires. Work of the State Forester, carried on under the reforestation act.

without being destroyed. This protective moth belt is usually kept sprayed, and thus the insects are poisoned before they get across it.

This same belt can also be utilized as a forest fire line, as it serves to make a stand against a fire, if it is so desired. Old wood roads can be made to answer nicely for these belts. In the first place, the road is needed for getting spraying pumps through for moth suppression, and forest fire wagons need similar conditions; now, if roadsides are widened on either side, giving the width mentioned, both purposes are accomplished. Forest wardens and moth superintendents should take advantage of these conditions, and work together in getting more of these protective belts in the town.

CAPE FOREST FIRES.

Each year great waste and destruction from forest fires seem to visit some section of the Cape country. This condition has continued so long and become so common that not only are many thousands of acres reduced to acorn brush deserts, but, from their being burned over every few years as soon as they accumulate enough vegetation to feed the flames, there is little likelihood of conditions improving until something is done.

Where fires have been kept out and even nature had a chance to assist, we find sufficient forest growth to really amount to considerable commercial value. Even on rough, rocky and ledgy lands, as well as those of pure sand, if we will keep out fires so that a forest floor can accumulate, the mulch or humus, which is composed of decaying leaves, twigs, etc., will form and here magnificent forests can be grown. The early history of this country tells us that the Cape was completely forested, and if it was once, it can be again reforested under modern methods. First of all we must stop the forest fires.

The pitch pine revels in the Cape conditions more than most other species, because it has a thick bark and can withstand fires better than most other trees; and then, again, it propagates easily from seed, even small specimens yielding more or less cones. If this tree will grow under such adverse conditions, were we to assist it in its struggle and even collect and plant or

sow the seed, start nurseries and transplant the seedlings, we soon could bring about great results on the Cape. Nor are we confined to the pitch pine. Many more species of trees will grow here when once they are given a little consideration as regards shelter, soils and freedom from fires.

Last summer a forest fire of approximately 10,000 acres burned over a territory in the towns of Bourne and Falmouth. Upon making a thorough examination of this fire, as to its causes, methods of handling, etc., it is evident that this forest fire which laid waste this vast territory could have been handled easily and controlled with comparatively no damage had there been any organized effort or suitable equipment.

From data secured through competent men, whose reports are now on file in the State Forester's office, together with photographs showing conditions where fires crossed roads, maps of the territory burned each day, it is evident that if we Massachusetts people are willing to allow such conditions to continue to exist, we certainly are neglecting our birthright.

If towns are not willing or able to protect themselves, the State should step in and regulate or assist. Since this large fire the towns adjacent have been aroused to activity in future protection, and it is hoped this interest may not die out until something results.

It is generally acknowledged that these fires originate from Mayflower gatherers and blueberry pickers. It is evident that this being the case, some regulations must be made for fixing the responsibility and punishing the offenders.

It is understood that the association composed of the boards of selectmen of various towns expects to ask some legislation on this subject this year.

AUTHORITY TO ACCEPT DONATIONS.

If the State Forester were given authority to accept lands or funds on behalf of the Commonwealth which are to be used for State reserves and managed by the State Forester, with the understanding that all net sales from the management of such lands shall be used by him for improving State forestry conditions, subject to the approval of the Governor and Council, it is

believed the State would derive a great deal of benefit. This suggestion has come to the office a few times from such sources as we have reason to believe would be interested in aiding the future forestry work in Massachusetts.

PUBLIC LECTURES AND ADDRESSES.

As heretofore, the State Forester has endeavored to do as much of this kind of work as he could consistently, and keep up the regular routine work of the department. More engagements have been filled than ever before. The policy of accepting invitations preferably when a large and representative audience is assured (not less than 100), and the meeting an open one, has been adhered to this year, as last. The requests for lectures have been greater than ever.

Besides the 51 lectures by the State Forester, occasional engagements have been filled by assistants. The usual course of lectures was given at the Massachusetts Agricultural College during January.

MEETING WITH THE STATE FIREMEN'S ASSOCIATION.

The State Forester was requested to again address the State Firemen's Association on the occasion of their annual meeting, held at Plymouth, September 15. Chiefs of the fire departments have expressed a willingness to co-operate with forest wardens in suppressing forest fires, and have offered in many instances to instruct the wardens in the use and care of extinguishers. The State Firemen's Association also sent representatives to address the conference meetings of forest wardens at Northampton and Boston, the subject being, in each instance, "The Co-operative Relations between the Firemen's Association and the Forest Wardens."

THE SOCIETY FOR THE PROMOTION OF AGRICULTURAL SCIENCE.

This organization, which is the oldest and most influential society of the kind in this country, held its meeting at Portland, Ore., on August 17, and the State Forester, who is secretary-treasurer, attended this meeting. The special program for this occasion was "Forestry," and various phases of the subject were

discussed by leading scientists from different sections of the United States. This meeting was held directly after the National Irrigation and Forestry Congress, and just before the Association of American Agricultural Colleges and Experiment Stations.

I also visited Seattle, where the Alaska-Yukon Exposition was held. Besides the excellent forestry exhibit, occasion was offered here to spend some time with the fire warden of the State of Washington and various lumber companies, in getting a better idea of the forestry methods used.

The following statement was given to the press upon my return:—

On a recent trip through the northwest, I have had splendid opportunities to examine the magnificent forests of that section. This was not my first trip, and hence, from a forester's standpoint, it has proven even more interesting. One is first impressed with the great amount of forest products and particularly by the cheapness thereof; but upon further reflection and study of the area and prices, it grows upon one that after all we Massachusetts people get very little benefit from them. While prices are relatively low, that country is so far away that other than for our best grades it is prohibitive for our use. Fine, square-edged lumber is looking for a market in Washington to-day, and it is offered for much less per 1,000 feet than we get for our round-edged box boards. There are hundreds of miles of treeless areas between here and there, and a country that will demand in a few decades even more forest products than the famous forests will be able to supply. We Massachusetts people must depend for our future lumber supply, I am convinced, upon our own well-directed efforts.

Our people may think their State Forester is overzealous in regard to forestry matters, but he is more willing than ever to go on record in stating that there are few subjects of more importance at the present hour that really need the attention of our Massachusetts people than that of reforestation, and even more mandatory laws governing forestry management. Every dollar rightly spent in the old Bay State now is bound to return us 100 per cent. in future benefits.

CONFERENCES OF FOREST WARDENS.

During the latter part of October and fore part of November the State Forester held a series of five forest warden conferences, which were distributed evenly throughout the State. All the forest wardens of the State were invited to attend, with their

travelling expenses paid, as per chapter 475, section 8, Acts of 1907. The first conference was held at Pittsfield, on October 14, and included all of the towns in Berkshire County; the second, at Northampton, on October 29, included Hampshire, Hampden and Franklin counties; the third, held at Boston, State House, on November 4, included all the towns in Essex and Suffolk counties; the fourth convened at Worcester, on November 11, and included the towns of Worcester County; while the fifth, held at Middleborough, on November 18, consisted of all the counties of the Cape, Plymouth, Barnstable and Dukes.

These meetings were the first attempts to get the forest wardens together. The conferences were in each case held throughout one day, beginning at 10 o'clock and continuing until 4 P.M., taking out only forty-five minutes for lunch. The program consisted in a general outlining of the State's policy by the State Forester, which was followed by a discussion for the remainder of the forenoon, in which the wardens took an active interest. Other subjects discussed by competent speakers were: reforestation; forestry management; forest insects and their control; co-operation of railroads; co-operation of chiefs of fire departments with forest wardens; forest fire equipment; co-operation between towns, etc.

As was expected, there was not sufficient time to go into the subjects in detail, but one of the great benefits was in getting the wardens together, and setting them to thinking in lines of accomplishing results in their towns.

Splendid interest and a very co-operative feeling were manifest at each meeting, and it is the opinion of your State Forester that the expenses for these meetings will be as productive of future results as any money investment this year. The total expenses of the five meetings did not exceed \$500. The benefits of these conferences are already shown in the increased interest of the forest wardens in sending in reports of fires and in asking for assistance in their work. This conference in the future will resolve itself into a gathering whereby we may keep posted on modern methods of fire fighting and other forestry operations.

MUNICIPAL FORESTS.

This type of forestry work has again received more or less of our attention this year. The forest working plan for land belonging to the city of Fall River in the North Watuppa watershed, which is the water supply for that city, was completed and published in a bulletin from this office. This bulletin has not only proved of interest to other cities and towns as well throughout the State, but has been called for by many cities from outside the State. When the advantages to be derived from such undertakings become more fully understood, there is little doubt but that the recommendations outlined in the bulletin mentioned will be generally carried out and put into practice. This bulletin was not generally distributed, but can be had by any one interested in such work.

BULLETIN ON FOREST FIRES.

A bulletin entitled "We must stop Forest Fires in Massachusetts," was published during the year. It contained 44 pages, and was published that our people may realize more fully the exact condition of forest fires in the State, and especially to bring together data for the benefit of our forest wardens and their deputies, that they may know what the better towns of the State are doing, thereby gaining new ideas and being enabled more intelligently to accomplish good results in their own communities. The bulletin contains several illustrations of forest fire wagons and equipment, together with estimate costs; and gives a list of all the forest wardens, with their addresses, from each town and city in the State.

BULLETIN ON THINNING.

The first bulletin on "Forest Thinning" has been exhausted for some time, and we have a new bulletin now in press on this subject, which contains some definite experimental data of Massachusetts conditions and treats the subject in an up-to-date manner. This bulletin will be of interest, we believe, to the whole State, and particularly throughout the gypsy-moth-infested



One of the roads that the Bourne fire crossed. Had this roadway been widened, it would be a natural fire lane. Had there been a well-organized force, the fire should have been stopped here. By making a study of our town and wood roads throughout wooded sections, and widening them for fire belts, much of our present fire losses could be curtailed.

territory; for, by thinning our woodlands properly, the conditions are not only better for forestry proper, but for the suppression of insect pests.

PERMIT ACT, RESULT OF VOTE.

The results of the vote by our Massachusetts towns on the permit act were very satisfactory, and for the most part the act was adopted. The failure of a few towns to accept the provisions was found to be due to a misunderstanding of the objects sought, and they will probably adopt the law at their coming annual town meetings. Forest wardens generally are convinced of the value of the permit act in lessening forest fires, while this office can point to far more efficient service throughout the State.

MASSACHUSETTS FIRE PERMIT LAW.—TOWNS ACCEPTING CHAPTER 209, SECTION 5.

Towns voting to accept the law,	248
Towns voting to reject the law,	15
Towns failing to report on vote (probably favorable),	47
Towns postponing action on the law,	7
Chapter 209, section 5, does not include the cities whose ordinances should cover same,	27

CO-OPERATION WITH THE UNITED STATES FOREST SERVICE.

The State Forester has been favored with hearty co-operation from the United States Forest Service throughout the year. The work on "Massachusetts Wood-using Industries," which was begun last year, has been completed and is now in press. Mr. H. S. Hackett, in charge of wood utilization, and Mr. Hu Maxwell, expert, both of the United States Forest Service, have rendered us splendid service in this work.

Recently arrangements have been made with another department of the United States Forest Service, under the supervision of Mr. J. G. Peters, to carry on some co-operative work in forest survey work.

The State Forester wishes to acknowledge many other courtesies extended to him by Mr. Gifford Pinchot and the United States Forest Service.

PINE TREE BLIGHT.

The alarm in regard to the disease called the pine tree blight, which was so prevalent two years ago, has very much subsided of late. Occasional trees have died from this cause during the year, but nothing equal to the number of last year, which in turn was less than that of the year before. Our people generally have become familiar with it, and are following the practice of cutting out and utilizing all pine trees of commercial size that are badly affected. It is quite generally believed that we have little to fear from this malady in the future in growing white pine.

THE CHESTNUT BARK DISEASE.

This disease of the chestnut has been extremely disastrous along the southern Hudson River district and in certain sections of Connecticut. By reading about it and its results in the above-named territory, many of the people owning chestnut forests have become alarmed and written to our office. We have not as yet had any large area reported which was thought to be infested with this chestnut disease. Experts on the subject seem to differ as to the cause of the depredation. The United States Department of Agriculture claims the disease is *Diaporthe parasitica*, and that it is contagious; while equally skilled botanists, like Dr. G. P. Clinton of Connecticut and Dr. G. E. Stone of Amherst, claim that it is due to unfavorable climatic conditions.

It is believed to be unnecessary for us to worry at present over the chestnut bark disease in Massachusetts. If chestnut trees here and there become unhealthy, it is a safe rule to remove them, and thus minimize possible trouble. This method we are practising with the white pine blight. It is certainly to be hoped that this trouble may not come our way, for our chestnut growths are valuable properties.

FORESTRY EXHIBITS.

During the year various forestry exhibits, mainly showing moth work and seedlings, have been made, the principal ones being before the following organizations: the New England

apple show, Boston, October 18-23; the Boston “1915 Exhibition,” Boston, during November and part of December; and at the meeting of the American Association of Economic Entomologists, Boston, December 27-29. The other displays were largely made before agricultural fair associations in the newly infested sections.

MASSACHUSETTS FORESTRY WORK RECOGNIZED IN OTHER STATES.

During the past year we have had cause to feel complimented upon our work, as the State of New York, in a bulletin entitled “Instructions for Reforesting Lands,” published, with due credit, many tables found in our handbook on “Forest Mensuration of the White Pine.” Also, this pamphlet of ours has been sought by many forest schools. Another of our publications, “Forest Trees of Massachusetts, how you may know them,” a pocket manual, was practically copied in full by the Maine Forestry Commission. Other States have in part adopted the Massachusetts forestry legislation.

EXPENDITURES AND RECEIPTS.

In accordance with section 6 of chapter 409 of the Acts of 1904, as amended by the Acts of 1907, chapter 473, section 2, the following statement is given of the forestry expenditures for the year ending Nov. 30, 1909:—

FORESTRY EXPENDITURES.	
Salaries of assistants,	\$3,875 70
Travelling expenses,	1,083 24
Stationery, postage and other office supplies,	1,048 35
Printing,	1,018 85
Instruments,	80 17
Forest warden account,	290 44
Nursery,	2,305 94
Co-operative work with the United States Department of Agriculture,	215 00
Miscellaneous,	81 95
	<hr/>
	\$9,999 64
Balance,	36
	<hr/>
Total appropriation,	\$10,000 00

REFORESTATION ACCOUNT.

Seedlings,	\$771 01
Land,	1,792 50
Labor,	5,769 47
Equipment,	663 58
Travelling,	846 31
	<hr/>
	\$9,842 87
Balance,	157 13
	<hr/>
Total appropriation,	\$10,000 00

There was realized from the sale of publications \$73.62, which amount has been turned over to the Treasurer and Receiver-General. If to this amount are added the amounts unexpended, \$157.49, we have \$231.11 as a credit for the year.

In accordance with section 5 of the above-named chapter, the following statement is given of the receipts for travelling and subsistence:—

LECTURES.

Auburndale Improvement Association,	\$0 50
Attleborough Women's Club,	1 50
West Manchester Women's Club,	—
Montague Agricultural School,	50
Cornell Club,	2 00
Leominster Board of Trade,	1 74
Quincy Unitarian Club,	46
Amesbury Women's Club,	1 70
Cambridge Entomological Club,	—
Mangus Club, Wellesley Hills,	50
Fall River Natural Science Association,	5 00
Chicopee Falls Women's Club,	5 50
Milton Women's Club,	35
Agriculture Board of Trade,	2 50
Farmers' Institute, East Charlemont,	6 24
New England Rural Conference,	—
Concord Women's Club,	85
Men's Club, Melrose,	1 00
Fitchburg Grange,	3 00
Farmers' Institute, Brimfield,	4 55
Boston Merchants' Club,	2 00
High School Masters' Club,	75

North Reading Grange,	\$1 29
Farmers' Institute, West Brookfield,	4 15
Plymouth Board of Trade,	3 50
Middlesex Women's Club, Lowell,	2 50
Lexington Grange,	1 25
Lee Grange,	8 10
Swift River Valley Pomona Grange, Greenfield,	6 67
State Board of Agriculture, Cummington,	10 14
New Hampshire Board of Trade, Manchester,	4 00
State Firemen's Association, Plymouth,	3 50
Board of Agriculture, Barre, Fair,	3 10
Pittsfield Wardens' Conference,	—
Northampton Wardens' Conference,	—
Boston Wardens' Conference,	—
Worcester Wardens' Conference,	—
Middleborough Wardens' Conference,	—
Gardner Women's Club,	3 31
Channing Club of Boston,	1 00
Hyde Park Current Events Club,	50
The Atalanta Club, Lynn,	1 10
Palmer Men's Club,	3 40
Cantabrigia Club, Cambridge,	1 00
Boston Society of Civil Engineers,	1 22
Economic Club, Boston,	22
Boston Market Gardeners' Association,	2 00
Massachusetts Reform Club, Boston,	22
Massachusetts Forestry Association,	—
Conservation Club, Kingston,	1 50
American Forestry Association,	25 00
Friday Club, Everett,	25
Webster Grange, Marshfield,	1 50
Becket Camp, Becket,	4 00
Harmony Grange, Easton,	1 00
Holden Farmers' Club,	1 00
Cape Ann Literary Association, Gloucester,	1 25
American Association of Economic Entomologists,	—

A list of the visits made, the area of woodland involved and the receipts for expenses, are as follows:—

EXAMINATIONS OF WOODLANDS.

NAME OF OWNER.	Town.	Area (Acres).	Expense.
Adams, Sarah E.,	Pembroke,	7	\$2 00
Barryune, F. J.,	Lynnfield,	22	1 00
Barnes, H. K.,	Shirley,	43	1 40
Burbank Hospital,	Fitchburg,	400	12 40
Burgess, J. K.,	Dedham,	50	50
Carpenter, S. I.,	Sharon,	15	80
Clapp, W. A.,	Ashland,	90	1 00
Cook, Robert,	Brookton,	50	1 00
Cunningham, Paul,	Bolton,	125	1 45
Crane, A. S.,	Weston,	5	— ¹
Dole, W. A.,	Townsend,	28	1 60
Emery, Miss M. E.,	Newburyport,	55	1 50
Foxborough State Hospital,	Foxborough,	110	1 25
Fillebrown, Mrs. W.,	Plympton,	50	1 25
Gaskill, D. W.,	Blackstone,	75	1 50
Gilbert, E. H.,	Ware,	170	3 50
Greenwood, Levi,	Gardner,	275	4 80
State Board of Insanity,	Lexington,	20	2 80
Hubbard, Eliot,	Millis,	40	90
Humphrey, L. C.,	Rochester,	200	2 10
Hyde, H. S.,	West Springfield,	60	4 30
Jones, C. H.,	Weston,	200	— ¹
Joslin, E. P.,	Oxford,	100	2 40
Harlow Brook Cranberry Company,	Wareham,	1,000	2 00
Libby, F. M.,	Wakefield,	10	— ¹
Manning, Warren,	Billerica,	78	— ¹
Milford Water Company,	Milford,	175	1 50
McCarthy, N. F.,	Lynnfield,	50	— ²
Matthews, W. L.,	Conway,	50	4 60
Morse, Prof. A. D.,	Pelham,	300	3 80
Needham Park Board,	Needham,	60	35
Newton City Forester,	Newton,	10	— ²
Paine, Chas.,	Sturbridge,	125	3 00
Parker, F. H.,	Westborough,	175	1 00
Parker, Chas. S.,	Westford,	23	70
Prescott, C. W.,	Concord,	60	— ¹
Simmons, H. F.,	Hanover,	10	1 25

¹ Train fares paid by owner.² No expense.

Examinations of Woodlands — Con.

NAME OF OWNER.	Town.	Area (Acres).	Expense.
Swett, Frank,	Westminster, . . .	103	\$2 50
Symington, R. B.,	Plymouth, . . .	2	3 95
Thorndike, R. K.,	Millis,	20	90
Tolland Fish and Game Association,	— —	500	8 50
Walker, Mrs. J. G.,	Hamilton,	6	1 00
Warren, Fiske,	Harvard,	285	1 85
Whitney, Fred,	Leominster,	12	1 75
Williams, G. F.,	Needham,	200	— ¹
— — — — —	Canton,	8	— ²
Y. M. C. A. Camp,	Becket,	200	5 40
Massachusetts Fish and Game Association,	Carver and Plymouth,	6,000	3 40
Barclay, Fred,	Spencer,	200	— ²
Freeman, Lucy,	Wrentham,	30	1 30
Hillside Industrial School,	Greenwich,	300	4 00
Gloucester Common,	Gloucester,	1,500	2 05
Conservation Association,	Kingston,	1,000	1 50
Bill, Nathan D.,	Worthington,	600	4 80
Adams, Chas. F.,	Lincoln,	500	70
Newton, Mr.,	Royalston,	23	3 00
Dexter, Prof. F. B.,	Fairhaven,	8	2 70
Symington, R. B.,	Plymouth,	4	2 00
Thompson, M. S.,	Newbury,	40	1 50
Lane, Emory,	Waltham,	5	— ²
Total, . . . . .	. . . . .	10,860	—

¹ Train fares paid by owner.² No expense.

PART II.

GYPSY AND BROWN-TAIL MOTH
SUPPRESSION.

PART II.

GYPSY AND BROWN-TAIL MOTH SUPPRESSION.

GENERAL CONSIDERATIONS OF THE YEAR.

The work of suppressing the gypsy and brown-tail moths in the year 1909 has been carried on along well-defined lines which have been determined through previous experience to be the best, and in most cases gratifying results are shown. Weather conditions have been favorable for our work, and also for insect life. Natural causes, such as the wilt disease of the gypsy moth caterpillars, have been helpful to some extent in badly infested woodlands. The brown-tail moth caterpillars came through the winter season very well, and but a small amount of the fungous disease was noticeable; consequently, there was need of more work against this insect than in previous years. The usual methods of treating the gypsy moth egg clusters with creosote, and removing the brown-tail webs and burning them, were prosecuted vigorously during the winter and early spring, and unusually extensive spraying operations were carried on during the caterpillar season; there were 150 large power outfits in operation, and 200 hand outfits; consequently, more noticeable results were obtained from spraying than in previous years. There were used, as near as can be ascertained, about 300 tons of arsenate of lead. The maximum number of men engaged in the work at any one time during the year was 2,750.

During the month of August in many cities and towns there was a cessation of field work, on account of lack of funds, owing to the fact that so much more spraying than usual was done in June.

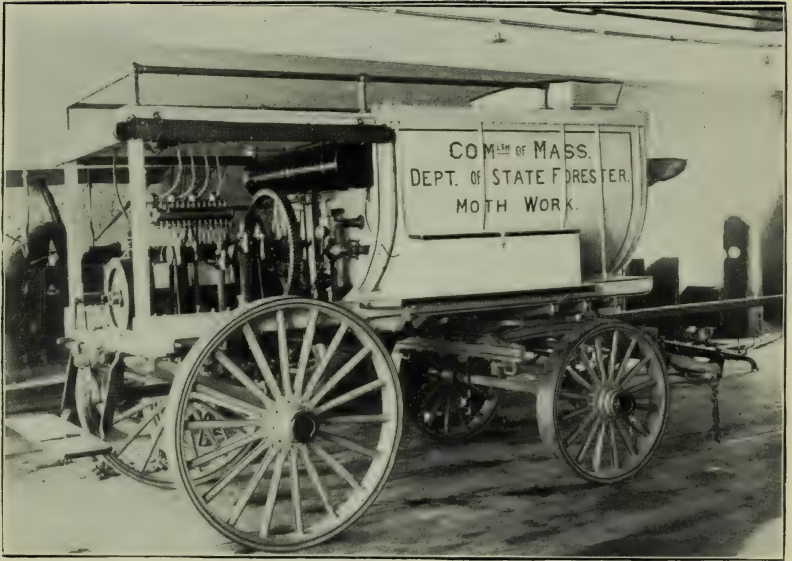
The area infested by the gypsy moth in Massachusetts comprises 3,950 square miles. Although the known spread has been

very slight during this year, the infestation in the central western part of the State is being watched closely, as it is from that point that the insect is most likely to spread, and thus far no noticeable increase has been made westward. It is generally believed from observations that the spread of this year has been northerly, if in any direction.

The work carried on by the cities and towns has been commendable in most cases, although there are a few instances where the indifference of the people, or the neglect and lack of interest on the part of the public officials, has caused great annoyance and considerable damage. Unfortunately, these cases have been in some of our large cities, and have given the bordering places anxiety. There are municipalities where the infestation has been bad in previous years, and where the property holders have suffered greatly from the pests, and much money has been expended, with the result that they are now in comparatively good condition. Here, efforts are apt to be relaxed. If these places are not carefully watched now, there will be a repetition of the conditions of past years.

In October a reduction of our field force was made, for, as the local superintendents have had nearly five years' experience in the work, less inspection and instruction from this office should be necessary. This will make a saving in supervision, and enable us to assist cities and towns financially to a greater extent. The infested area has been divided into 15 divisions, and a division superintendent retained for each division. The inspectors we have retained are also responsible directly to this office. Most of our agents and division superintendents have been provided with motor cycles, and are now able to keep in closer touch with the work in their towns for about nine months in the year than before, when they were dependent upon steam or electric cars, or walking.

By the approval of the Governor, the co-operative work in the north shore woodlands has been carried on as in previous years, with an expenditure there of nearly \$58,000, of which \$22,500 has been furnished by the State. A much larger area was covered than in 1908. This office has also supervised the scouting work on the State highways for the State Highway Commission.



Gasoline power sprayer, built by State Forester's department, with four-cylinder engine and triplex pump, the latter designed by same department, capable of furnishing 300 pounds' pressure in woodland work. Weight of outfit, 3,000 pounds.

APPORTIONMENT OF ALLOTMENTS.

The problem of apportioning our appropriations among cities and towns where the liability under the law is not sufficient to cover the necessary work, is one of the most difficult connected with this work. At the beginning of the fiscal year it is comparatively easy to apportion the continuing appropriation according to the needs of each town; but later in the year, when the Legislature has made an additional appropriation, as it has in years past, which must be divided fairly among the most needy municipalities, a problem arises which is hard to solve. This is because we are often unable to secure proper returns of expenditures already made from cities and towns expecting reimbursement. These cities and towns are not unaware of the necessity, but they are neglectful.

When allotments are made, local officials should all see to it that expenditures are kept within the limits laid down by this office, unless they are willing, if need be, to provide for the extra expense by extra town appropriations. It should be the aim of each local superintendent to carry on his work as economically as possible, and in cases where large allotments have been made in the past, the towns should be nearer to being self-supporting each year. There are still, however, badly infested towns needing more money than the State can give them at the present time, with available funds.

SCOUTING.

At the beginning of the year 1909 it did not seem advisable to do scouting work to the same extent as in the past two years, as the towns bordering on the infested area had been carefully inspected last year. Only such places, therefore, as were most exposed to infestation were scouted. In previous years the whole cost of this work has been borne by the State, but this year arrangements were made for cities and towns to employ our trained men to do the work, and much better results were thus obtained. We believe it to be good policy to do this scouting when necessary, as small infestations can be handled easily when first found, and often stamped out if taken in hand in time.

In the central part of the State 15 men were employed in this work, and gypsy moth infestations were found in the following places: Hopedale, Lancaster, Mendon and Northborough. Also, the following towns were scouted, but nothing found: Blackstone, Boylston, Sterling, Uxbridge and West Boylston.

In the southern part of the State 6 men were employed, and the following towns and cities were thoroughly scouted: New Bedford, Fairhaven, Marion and Mattapoisett. In several other infested towns in this section our trained men were employed to scout thoroughly, that the exact conditions might be ascertained.

In the extreme western part of the State, the towns of Lee, Lenox and Stockbridge were given a thorough examination, as they are much frequented by automobiles from the heavily infested section. The main highways in the city of Pittsfield were also scouted, but nothing was found in any of this western section. In the city of Springfield and the towns of Greenfield, Palmer and Warren, where infestations were found in 1908, no signs of the moths have been seen this year. During the coming year it may be advisable to do some scouting in the towns of Orange, New Salem, Dana, Hardwick, New Braintree, North Brookfield, Brookfield, Charlton and Sturbridge, but this will depend largely on conditions found in adjoining towns.

THE CONDITION OF THE INFESTED DISTRICT.

The larger part of the area known to be infested with the gypsy moth is to-day in most cases in a better condition than at the time of the writing of the last report. The work in the sections where the worst infestations have been found this year has been done generally in a very thorough manner, and excellent results obtained. This applies mostly to residential sections, and belts in woodlands for the protection of sections already cleaned. In our judgment, these good results are due to the efficiency of the local forces, gained through their long training in certain towns where the moth work has been carried on extensively. We have done, as far as possible, the necessary work in the worst-infested districts, but the woodland work still suffers from lack of funds.

In some places results worthy of note have been obtained, as

in the case of the city of Newton. Here, through the neglect of the city government to make suitable appropriations at the time when the infestation was light, and when it could have been handled with comparatively little expense to the city, a large expenditure of money has been necessary this year to keep the moths in check. In the latter part of the year 1908 this city realized the danger which threatened it from the ravages of the gypsy moth, and took hold of the situation in a competent manner, engaging an experienced man to take charge of the work. Throughout the year 1909 the work has been carried on vigorously. At times it has been necessary to employ as many as 200 men, and during the caterpillar season a large number of spraying machines were used. This surely should be an example and object lesson for such places as are to-day in similar condition to that of Newton, and funds should be made available at the proper time, as suggested by this office. It is a fact that where, through the indifference of the local government, moth pests are allowed to go unchecked for a certain length of time, the result is a large expenditure finally, and severe damage from the ravages of the moths. In sections where infestations have occurred in the northern part of the State, not as bad as in Boston and vicinity, the gypsy moth has shown some increase from the fact that in most cases the cities and towns were not able to engage experienced men for the work in the past; that is, this year's scouting has been done by more experienced men, and therefore has perhaps in some places brought to light more widespread infestation, but in most cases this infestation is very light, and should cause little anxiety. Where the infestation is light, the towns as a rule have handled it well, and these places have also been given close supervision by our men.

It is the aim and object of this office, where it is possible, to put cities and towns infested with either of the pests in a condition so that they may become self-supporting; that is, in such condition that the towns' own liability under the law ($\frac{1}{25}$ of 1 per cent. of the valuation of the town or city where it is under \$12,500,000, or \$5,000 where the valuation is over \$12,500,000) will pay for all the necessary work to keep the towns free from the nuisance. We expect the coming season with the expendi-

ture of small sums from the State to have several municipalities put in this condition by doing thorough suppressive work.

We shall also be obliged, in several cases where cities and towns are not ready to make necessary appropriations, to adopt such methods as the law allows to make sure that the necessary work is done in a thorough manner. Although these cases may be few, it is not justice to the adjoining cities and towns to allow such places to continue delinquent in making appropriations, or to continue to do the work in an unsatisfactory manner.

Work in woodlands which are heavily infested should be given careful consideration before it is entered upon. If it is found necessary to take such work up, careful consideration should be given to the future, as it will probably mean a continued expense for some years to come, and it is not good policy to take up this work where it can not be followed out and carried to completion. The land valuation of woodlands is usually very low, and where only $\frac{1}{2}$ of 1 per cent. can be collected from owners, the expense of cleaning falls almost entirely upon the city or town, and State; and we believe that there should be some way provided by law, in cases where property owners will receive benefit from these operations, to make larger assessments on the same. The cord wood which is removed from cleaned woodland would in most cases pay for the greater part of the thinning; and, as expert foresters are available at all times in this office to lay out woodland work along scientific lines, the property owner is bound to profit in the end from this treatment.

The woodland work done the past year, with the exception of that done on the north shore, has been confined in most cases to the most valuable wood lots, as it seems a waste of money to expend large sums on scrub land.

The question of woodland work in any town should be taken up with representatives of this office, and a very thorough understanding of the matter reached before entering upon work of this kind. The condition of the residential section of the town must be considered before taking up woodland work. A prime consideration in woodland work is that it shall be of a protective nature, either to protect estates, or adjoining property which is not infested. In cases where a light infestation occurs, and the

necessary funds are available, it is advisable for some time to come to do nest treating through as much woodland as possible. This will hold the general infestation in check until such aid as may come from natural sources is sufficient to be appreciated.

The conditions in the woodlands on the south shore promise to be serious in the future, unless handled by removing the deciduous trees and confining the growth almost entirely to conifers. Through some part of this section there are valuable areas of white pine, and the work of clearing is being prosecuted vigorously, in the hope that we may save most of it, or that but slight damage may occur.

In the section of our State which borders on the New Hampshire line the work is being done very carefully, and very little spread is likely to occur from any of these bordering towns. However, the work is not as well done across the line in New Hampshire, where inadequate appropriations are made for the work, and very little care taken regarding the spread of the insects. It is our feeling that we should be given more protection here, as the expenditure in this section amounts to a large sum.

In the past season the brown-tail infestation in the Merrimac valley bordering along the New Hampshire line was very serious, caused chiefly by the fact that no suppressive work was done across the line. In fact, the infestation was so heavy that large sums of money had to be expended in work against these moths, thus handicapping our appropriations which otherwise could have been used in gypsy moth work, where it was much needed. The reinfestation of towns or estates already cleared, by proximity to neglected towns or estates, is one of the serious problems with which we have to contend.

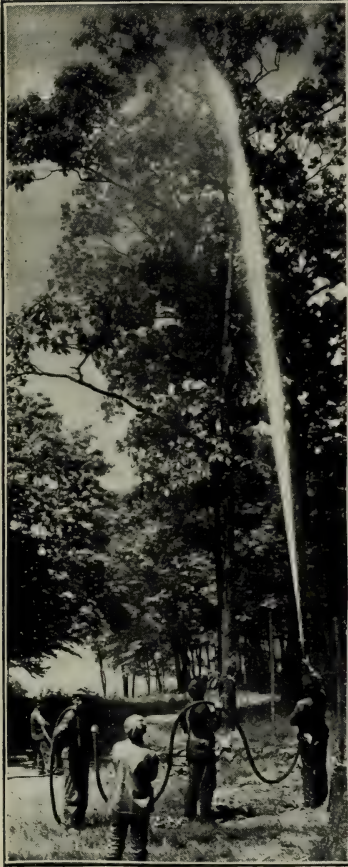
It may be interesting to note in this connection that from reports made to this office we find the number of acres sprayed throughout the infested district during the season to be 7,776; the number of burlaps put on, 698,597; and the number of tanglefoot bands, 26,313. These figures are of course approximate, several towns not having made complete returns.

CONFERENCE OF MOTH SUPERINTENDENTS.

On December 10 a meeting of all the local moth superintendents of the oldest infested districts was held at room 240, State House. The conference lasted from 10 A. M. to 4.30 P. M. In so far as possible, all the important points about future policies of the work were discussed by the State Forester and his assistants. Representatives from the laboratory discussed the parasites and their work, also specimens were passed about, to familiarize the men with them. The moth superintendents were left free to ask questions, and it is believed the day's efforts were well spent and will result in more efficient work this winter.

SPRAYING OPERATIONS.

During the year 1909 the spraying operations carried on against the gypsy moth caterpillars have been on a larger scale than ever before, and extremely good results have been obtained in most cases. The use of arsenate of lead in spraying the foliage has become one of the most efficient methods used in suppressing injurious insects, it being beneficial to the crop and detrimental to the insect. In cities and towns where the work has been carried on in an intelligent manner for the last four years, the street trees should be in such condition that spraying should not be needed; but during the past season the ravages of the elm-leaf beetle have been so severe in many such places as above mentioned that considerable spraying has been done on street trees for elm-leaf beetle where very little benefit was derived on the moth work. In a good many cases the spraying should have been done in other sections, to benefit the gypsy moth work; consequently, our work has suffered to some extent from this cause. The introduction of power outfits and their continued improvement has been one of the greatest benefits to the suppressive work against insects which we have ever had, for the problem is of such great magnitude that it would be impossible to accomplish the same results without them. It is believed that even more improvements will be made in the future as this method of combating insect pests is in its infancy at the present time.



OLD METHOD.



NEW METHOD.

The above illustrations show nozzle and shut-off designed by State Forester's department for woodland work, with $\frac{1}{4}$ inch straight tip; also, the nozzle formerly used, 18 inches long. Note difference in spray, as the long nozzle is carrying stream higher before breaking into mist.

The work of climbing large trees must be done away with as much as possible, as, in the limited amount of time in which spraying is effective, it is necessary to cover as much area as possible, and climbing is slow and expensive work. In using high-power outfits, the greatest care must be given to the way in which the solution reaches the foliage, because if it is put on with too much force the larger part of it runs off the leaves, and good results are not obtained; it is very essential that it be put on as nearly in the form of a mist as possible. The greatest trouble in many cases is that the man holding the nozzle stands too near the trees he is trying to spray; if care is used, the greater part of the foliage can be sprayed with the straight stream, and good results obtained.

Careful attention should be given to the machine itself, as breakdowns are often caused from neglect or inattention. As soon as a small fault is noticed it should be repaired, as if neglected it many times causes bad breaks and long delays. Machines should be kept properly oiled and cooled, the spark plugs clean, and plenty of gasolene on hand. Valves should be looked at if there is an uneven pressure. The machine should be given a thorough overhauling before starting for the field of operations. Good care should be taken of the machine, so that the depreciation from use may be as small as possible. The weight of large outfits often causes much comment, yet it must be considered that in order to obtain the necessary power and capacity a machine must be fairly heavy. Any machine that is in the market to-day can be easily handled on hard roads with two horses, but in doing woodland work it is necessary in nearly all cases to use four horses. The extra cost is not to be compared with results obtained. Much moving of apparatus can be avoided by using long lines of hose.

Poison should be used as economically as possible. The large amount used to-day makes the work very costly, and 10 pounds to 100 gallons of water in the first four stages of the caterpillar will give just as good an effect as a larger amount.

Observations should be made within three days of the spraying, to determine whether the work has been skilfully and effectively done. If caterpillars are still eating, and no dead ones

can be seen, the work has not been successful. Some of the causes which might account for this kind of work are as follows: weak poison, wet foliage, inefficient man at the nozzle, failure to cover the tree well, poor agitation, and presence of soluble arsenic in the arsenate of lead. This office furnishes the following formula for arsenate of lead paste:—

50 per cent. dry arsenate of lead.

No less than 15 per cent. arsenic oxide (AS_2O_5).

To contain not more than $\frac{3}{4}$ of 1 per cent. of soluble arsenic.

To contain no free acids or adulterant or inert substances.

To be in a good mechanical and physical condition.

Dealers should be required to supply arsenate of lead which will stand test for this formula.

CO-OPERATION ON STATE HIGHWAYS.

At the request of the State Highway Commission, which has a separate appropriation for the work of suppression of gypsy and brown-tail moths on State highway trees, this office has taken charge of the details of the work for the commission as in previous years, and also has supervised the elm-leaf beetle work on State highways in our infested districts. It has not been necessary during this year's campaign to do as much thinning on the State highways as in previous years. We have also been very fortunate in getting the federal authorities to take up some work on State highways, which has helped us considerably and has been of no expense to the Commonwealth. The elm-leaf beetle problem has been a most serious one the past year, and possibly has not been given as much attention as it should have had, as the infestation in some cases was new and unexpected. In the coming year more money must be available, and the elm-leaf beetle problem must be taken up at an early date, as part of the infestation occurs in towns and cities where we are doing very little spraying for the gypsy moth. The work of destroying the gypsy moth egg clusters and removing the brown-tail webs has been nearly completed at the present time, although there are a few remaining miles of road to be done in the near future.

This office recommends, also, the removal, if possible, by the State Highway Commission of some of the trees on the highway where they are in large numbers, more than are needed for good shade.

Work was done at a total cost of \$5,079.56 on the State highways in the following towns and cities:—

Abington.	Harwich.	Scituate.
Acton.	Haverhill.	Shrewsbury.
Amesbury.	Hudson.	Southborough.
Ashland.	Kingston.	Stoneham.
Barnstable.	Lancaster.	Stoughton.
Bedford.	Leominster.	Sudbury.
Bellingham.	Lunenburg.	Swampscott.
Bourne.	Marlborough.	Taunton.
Boxborough.	Marshfield.	Tewksbury.
Bridgewater.	Melrose.	Townsend.
Brewster.	Merrimac.	Truro.
Brockton.	Methuen.	Tyngsborough.
Chatham.	Middleborough.	Walpole.
Chelmsford.	Natick.	Watertown.
Cohasset.	Needham.	Wellesley.
Concord.	Newbury.	Wellfleet.
Draeut.	Newburyport.	Wenham.
Duxbury.	Norfolk.	West Bridgewater.
Falmouth.	Northborough.	Westborough.
Foxborough.	Orleans.	Westford.
Framingham.	Pembroke.	Weston.
Franklin.	Plainville.	Westwood.
Gloucester.	Quincy.	Weymouth.
Groton.	Raynham.	Winchester.
Hamilton.	Reading.	Wrentham.
Hanover.	Rockland.	Yarmouth.
Harvard.	Salisbury.	

NATIONAL AID.

In our work against the gypsy and brown-tail moths in this State during the year 1909 we have received considerable assistance from the federal government, in the way of clearing up strips along roadsides where distribution was liable to occur. This work is extremely helpful to this office. However, we feel that, though the quality of the work is good, there should be

more of it done by the federal authorities; that is, larger appropriations should be available. About \$750,000 are expended by the State, cities and towns and private individuals in this work during one year, while the federal government appropriates only \$300,000, and this must go to assist other New England States as well as Massachusetts. Our woodland infestations, in a great many cases where it has not been possible for us to do any work in the same, are gradually coming to the roadsides, and the road problem in our infested district now needs serious attention. We have made several suggestions to the federal authorities, such as that by making the strip which they clean along the roadsides narrower they might increase the number of miles which could be covered; but, as they have their plans made, and feel that what work they do must be absolutely protective, they do not think it wise to make the strip any narrower. It would be extremely helpful to our work and to the Commonwealth if larger federal appropriations could be secured and more work done in Massachusetts. However, we are thankful for what we are receiving along this line, and hope that it will continue and increase in the future.

SUPPLIES.

We made a careful estimate of the expenses of supplies for the State work during the past season, and it was found that had this office purchased them in large quantities, and supplied the towns the State is reimbursing, there would have been a saving of at least \$20,000. The results of this investigation were sufficient to secure the approval of the Governor in establishing a supply store by this office, from which supplies are to be hereafter sent to cities and towns receiving reimbursements from the State.

The local superintendent in charge of the work has been obliged to buy in quantities as needed for the local organization, and that necessarily in most cases is in small lots. Much lower prices can be obtained by purchasing in large lots. Also, it was found that in ordering supplies from Boston it was necessary for the local men to make several trips to the city in order to select the goods wanted. This office has also ex-

perienced considerable trouble in obtaining schedules of bills with receipted vouchers for supplies, and the examination of these papers has entailed a large amount of bookkeeping. Under our new system a part of this can be done away with. It will not be necessary for the local man to come to Boston personally to order his supplies, as he is furnished with a complete list of the supplies the State furnishes. These have been very carefully selected by experienced men, and the town officials are assured that it is our intention to furnish tools and supplies which will be best suited to the work. It is always desirable to have the local superintendent spend as much time as possible with his men, as efficient supervision means efficient work, and this arrangement will save much time.

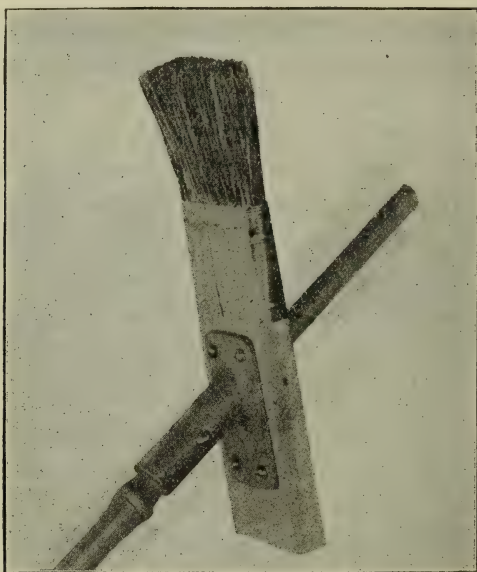
We have asked the local official who has charge of the work in the towns and cities where we are furnishing supplies for any suggestion which he thinks will improve this new system, and if at any time local superintendents can buy as cheaply and get as good quality of goods, we shall be willing to authorize them to do so.

EXPERIMENTAL WORK.

In the four years past very little experimental work has been carried on by this office, and we have been at the mercy of manufacturers and dealers as to what material or apparatus we have been obliged to use in the work. However, it now seems advisable that, owing to the large amount of money that is being expended in this work, some experimental work should be carried on relative to the apparatus used in fighting the pests, as well as in regard to habits of the insects and their natural enemies; and we are bending our efforts at the present time to the solving of several problems which have arisen in our use of apparatus. We hope in the future to have something more effective in the way of apparatus, and also to find some improvements in the methods of doing our work. During the past spraying season it has been noted that on the large outfits the nozzles, and also the couplings in the hose which were being used, offered too much resistance to the pressure which we were trying to obtain. In spraying with large power outfits, the use of 1½-inch hose was preferable to any smaller size, from the fact

that a higher stream was obtained; but at the same time a 1½-inch hose was so heavy and clumsy that it lowered the efficiency of the men; so we have been experimenting with a coupling that will not offer as much resistance as the coupling which has been in use on smaller hose, and hope to produce something which will give us the full inch stream in inch hose.

Also, in our nozzle experiments we have succeeded in making a nozzle to be used in woodland work that will carry the stream



Pole brush with bracket, designed by State Forester's department for creosote work.

much higher than anything we have used up to date, as it has a tendency to allow the stream to go higher in the air before breaking into mist, instead of breaking almost instantly after leaving the tip, as in the old nozzle.

In the large power outfits it has seemed to us that we were not getting the efficiency that we should expect from such high-priced apparatus, and we are at the present time experimenting along these lines, hoping to produce a large outfit that will be more efficient than the ones now in use. During the next caterpillar season a series of experiments will be carried on in woodland colonies, to see if any more economical method of sup-

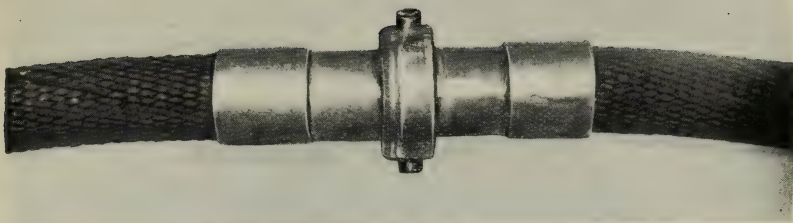


FIG. 1.—New full-way coupling.

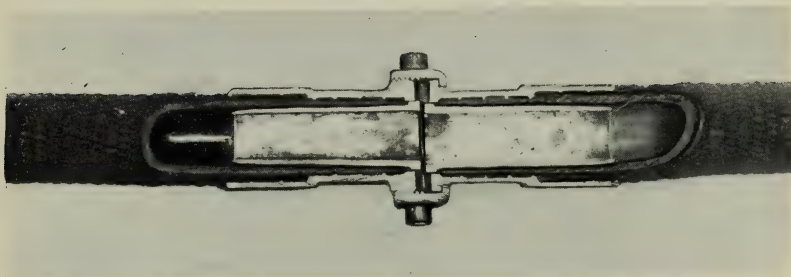


FIG. 2.—Inside and design of full-way coupling.

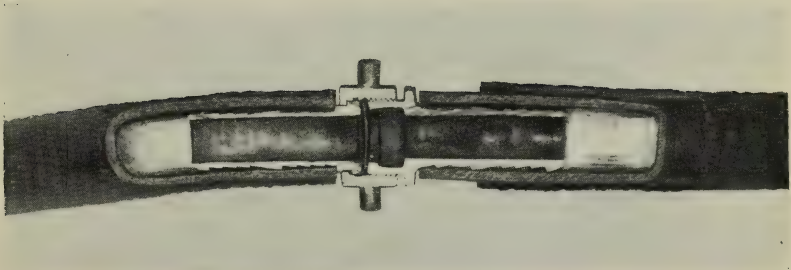


FIG. 3.—Long-tailed coupling, and resistance which it gives.

A new coupling, designed by the department of the State Forester, which will greatly advance the efficiency in spraying work.

pressive work than we are now using can be found. We have also made a bracket and holder for pole brushes, which has met with the approval of our field men.

NORTH SHORE WORK.

Very little work was done from July 15 to Dec. 1, 1908, in the colonies cleared and sprayed in the spring and summer, but several woodland colonies were scouted and conditions determined for this year's work. An arrangement was made on Dec. 1, 1908, for the prosecution of the work in 1909, with funds contributed by north shore residents, through their agent, Col. Wm. D. Sohier, and this office.

The woodland colonies bordering on property already cleaned and certain areas not touched last year were the problem of this year's work. The reinfestation of cleaned estates was to be avoided by this work. About 2,138 acres were treated, — nearly double the area treated in 1908. The cost of the work this year has been about \$53,000, compared to \$50,000 spent in 1908, and about twice as much ground covered this year as last.

In planning our work on the north shore this year the amount of apparatus necessary had to be considered, that remaining from 1908 not being sufficient. New apparatus was purchased, and at the beginning of the spring season eight spraying machines were in readiness for the work. These machines were constantly in operation for a period of twenty-five days, including Sundays, and we did not lose more than three or four hours' time on account of bad weather. Indeed, ideal weather conditions prevailed during the whole spring and summer.

We were fortunate in securing our poison at a very reasonable price, and very few delays occurred while waiting for poison. About 55 tons of arsenate of lead were used, and the work in general was very effective. In all the 2,138 acres sprayed there were not over five which showed any defoliation during the caterpillar season. We were also fortunate in some of the colonies cleaned in 1908 in having help from the wilt disease of the gypsy moth, and here, with the good results of the 1908 spraying, conditions were gratifying.

This year protective work was done to a large extent; that is, protective belts were cleaned on the borders of large colonies where it was too expensive to care for the whole colony. The work in these belts proved effective, and we shall probably be able to handle some of the other large and badly infested areas by this method in the future.

The colony known as "Bishop's Grave" colony, on the old Manchester road, which was the only badly infested spot in that section, was cared for by means of the protective belt and the use of tanglefoot. The colony known as the "Piggery" colony, also, was treated in this manner. This colony is bounded by Crooked Lane, Preston Place and Brookwood Road, and by large estates which are being well taken care of by the owners.

Considerable thinning was done in valuable pine lots, where it was necessary that work should be done immediately, if the trees were not to be defoliated and killed during the last caterpillar season. Tanglefoot was used on colonies where the trees were largely coniferous, and the results were very gratifying.

In increasing the number of our spraying machines we found that it would be necessary to have better facilities for getting water to our sprayers. One more water cart was purchased, and also a pumping outfit, which was able to force water 1,000 feet at a 75-foot elevation, and in that way very little time was lost in filling our machines with water. This pumping outfit was an experiment, and was found to be a good investment from an economic standpoint. Consequently, we shall find it advantageous to increase this line of apparatus in the coming spraying season.

The average cost of the work on the acres which were cleared and burned was \$32.88 per acre. This amount may seem excessive, but the explanation of this is, that in thinning in several of the colonies a great deal of deciduous wood was removed which made the clearing more expensive this year, but the work has put the colonies in good condition for future work.

In the spraying, over 2,138 acres were sprayed, at an average of \$9.44 per acre, and the creosoting which we did on 1,756 acres cost \$2.31 per acre. On the whole, the results for last season were exceptionally gratifying, and, as this piece of woodland

work is the largest of its kind ever done in this country, it is extremely interesting to note what can be accomplished where funds are available and the proper methods are applied.

The coming season a great deal of the work will be confined to roadsides, as in some of the woods, back farther from the shore than we can expect to care for, there are bad colonies reaching out to the roadsides, and in order to preserve valuable trees a strip 100 feet wide should be cleared. After consulting with the committee representing the north shore residents, we have deemed it advisable to follow out this course.

The thinning which is to be done on the north shore woodland for the coming season will be done along scientific lines, as an expert forester will be sent from this office to blaze all trees which are to be removed; this will be helpful to the men who have immediate charge of the work, as well as being a benefit to the owners of the woodlands to be thinned.

The co-operation in the work from the city of Beverly and the town of Manchester, also from the north shore residents and property owners, has been gratifying, and at no time have we been handicapped in this work by the indifference of any of the citizens in the district. We think it has been proved that in caring for woodlands it is very necessary that the best woodlands, or, in other words, the most valuable, receive the first consideration; and to care for this immense tract of beautiful woods, the most valuable of eastern Massachusetts, seems good judgment to us. The coming season we may find it desirable to work in co-operation with the city of Gloucester and the town of Hamilton, as well as with the town of Manchester and the city of Beverly, in caring for other woodland colonies which have now reached a condition where work is immediately necessary.

We give below a financial statement showing receipts and expenditures of the special north shore fund: —

SPECIAL NORTH SHORE FUND.

Dr.

To balance on hand Dec. 1, 1908, . . .	\$70 24
cash returned for tools lost, etc., . . .	31 45
Wm. D. Sohier, agent, . . .	22,500 00
town of Manchester, . . .	7,500 00
city of Beverly, . . .	5,000 00
cash received for work on private estates, .	1,905 75
Commonwealth of Massachusetts through this office, . . .	22,500 00
	<hr/>
	\$59,507 44

Cr.

By wages of employees, . . .	\$43,451 97
travelling expenses, . . .	467 95
rent, . . .	156 00
supplies, . . .	14,487 92
stationery and postage, . . .	1 17
sundries, . . .	209 91
	<hr/>
	58,774 92
	<hr/>
Balance on hand Nov. 30, 1909, . . .	\$732 52

DANGER FROM SPRAYING WITH ARSENATE OF LEAD.

This report would not be complete without cautioning people in regard to the danger where arsenate of lead is used for spraying purposes. All of the officials in charge of spraying have been cautioned repeatedly, and wherever any spraying has been done, notices have been posted calling attention to the fact.

There is a certain amount of danger to live stock which may feed upon vegetation beneath sprayed trees. Besides posting notices, the owners of lands thus sprayed should be notified. It is recommended in so far as practicable that the sprayed section be fenced off from the unsprayed, particularly where the lands are to be used for pasture. Again, where the grass and other crops beneath sprayed trees are to be cut and used for hay or fodder, at least two good drenching rains should occur between spraying time and harvest. There seems to be little danger in feeding sprayed hay to horses in any stage, but it is quite another matter with cattle.

The experience of the past year shows that comparatively little trouble has resulted, except in cases of negligence. We

have gladly looked into every case reported, and our diagnosis has proved that most instances attributed to spraying were due to some other cause.

Last spring a bulletin from the Colorado Agricultural Experiment Station, in regard to the detrimental effect of arsenate of lead upon trees, caused much unnecessary controversy, as we have found no basis for believing it harmful under Massachusetts conditions. Trees sprayed repeatedly with a heavy solution have failed to show any detrimental effects. We understand the United States Department of Agriculture is investigating the whole subject.

As was stated last year, in the case of the alleged death of live stock from spraying operations it is important that the viscera should be removed and subjected to chemical analysis, if claim for damages is to be made against the city or town. The Honorable Auditor of the Commonwealth has ruled that claims for loss from the death of live stock alleged to be due to spraying operations, under the direction of this office, are not a proper subject for reimbursement from the appropriations for the suppression of the gypsy and brown-tail moths; but that rather they fall in the class of consequential damages, which must be borne, if at all, by the city or town in which they occur.

THE DISEASES OF THE GYPSY MOTH.

During the past season a great amount of interest has centered in the diseases of the gypsy moth, owing to the prevalence of the so-called wilt disease.

This disease, alluded to in last year's report, was again taken up and studied under the direction of Dr. Theobald Smith of the Harvard Medical School. By an arrangement with Dr. Smith, one of his trusted assistants, Dr. H. N. Jones, was delegated to the work under his guidance. Dr. Jones has endeavored to determine the bacteria causing the disease, hoping to be able to spread it artificially, if found practicable.

Dr. Smith has submitted to the State Forester a detailed account of the whole season's work. It is not thought desirable that his report be published at this time, as it will take at least another season to determine any definite results. This

work will be continued the coming season, during which time Dr. Smith has every reason to believe he will be able to determine whether the disease is bacterial, or not.

Prof. W. M. Wheeler of the Bussey Institute, being interested in the subject, delegated one of his special students, Dr. William Reiff, to make a study of the effect of good and poor foods upon the gypsy moth larva. Professor Wheeler outlined some experiments, which Dr. Reiff carried on throughout the past season. The results of these experiments point to some very valuable discoveries, if they prove as effective as would appear from the first year's investigation. Dr. Wheeler, who was abroad most of the summer, very kindly went over the whole matter with the State Forester upon his return, and submitted a report of Dr. Reiff's work.

These experiments are to be continued during another season, at the end of which a substantial report will doubtless be printed. This office is to assist in the work by defraying Dr. Reiff's expenses.

Another line of investigation in progress throughout the year has been conducted by Dr. E. L. Mark, director of the Harvard Zoölogical Laboratory, to determine whether the cause of the wilt disease is due to protozoa. Dr. Mark has had Mr. Jas. W. Mavor, a special student, working under his direction since last spring. The results of this work will probably be determined this winter, as Mr. Mavor expects to shortly complete his examination of the material collected during the past season. It is hoped also that the results of this study may throw some light upon the better rearing of the gypsy moth larva at the laboratory.

Still another possible assistance in controlling the gypsy moth is through a fungous disease that was obtained by Dr. G. P. Clinton in Japan. This works on the insect just as the disease we now have works on the brown-tail. It is understood that Dr. Clinton's trip was made possible through some friend of Harvard University, who offered to finance the undertaking. This disease is now in the resting spore stage, and Dr. A. T. Speare, in charge of the work at present, hopes to establish it in the field this coming spring.

THE FUNGOUS DISEASE OF THE BROWN-TAIL MOTH.

This disease was outlined and discussed quite fully in last year's report. This past season arrangements were made with Dr. Roland Thaxter, mycologist of Harvard University, to carry on the work. Dr. Thaxter has conducted the work through his assistant, Dr. A. T. Speare, who last year assisted Dr. Clinton in work for this department. Dr. Speare was in the field early last spring, and has succeeded in placing out a large number of plantings of the disease, with very gratifying results. During last spring we furnished him with an assistant who prepared the specimens for distribution, and two climbers who distributed them. Fall plantings have also been made, and Dr. Speare feels very much encouraged over the outlook. Upon a trip taken with him this fall to examine the plantings, we found evidence that these plantings have been very effective. Not only were the artificial plantings a marked success, but the disease occurred here and there naturally, proving very efficacious.

We expect to continue this work next season, and we hope to be able to get the disease thoroughly established throughout the territory infested by the brown-tail moth.

• PARASITE WORK.

Every thinking person must feel that the danger which the gypsy and brown-tail moths threaten to our orchards, shade trees and forests, renders it highly important that every means suggested for their suppression, which offers reasonable hope of success, should be given a faithful trial. Actuated by this feeling, and having in mind the well-established fact that in Europe, where the gypsy and brown-tail moths are natives, serious outbreaks of these insects are checked by natural enemies, the Legislature of 1905 placed at the disposal of the State Superintendent \$30,000, to be expended as needed over a period of three years in the importation of parasitic and predaceous enemies of the gypsy and brown-tail moths. A sufficient amount of money has been made available by subsequent Legislatures to carry on this experimental work without interruption up to the present time.

In prosecuting this work the State Superintendent has been fortunate in having had the hearty co-operation of Dr. L. O. Howard, Chief of the Bureau of Entomology of the United States government, who is regarded as one of the best authorities in the world on parasitic work. Many other prominent entomologists, whose scientific attainments in this particular work place them in the front rank of their profession, have been here and investigated our methods of importing and distributing parasites, have given the department the benefit of their knowledge and experience, and offered such advice and made such criticisms as they thought might prove helpful. The findings of these eminent men were published in the third annual report of the State Superintendent, and in each instance were highly commendatory. Every valuable suggestion made by them was adopted and put into operation, and no stone has been left unturned which seemed to offer the slightest hope of success.

Now, after devoting nearly five years to this work, involving an expenditure of nearly \$75,000, it is pertinent to ask at this time if the results obtained are commensurate with the cost, and if the prospect for the future will justify the Commonwealth in continuing its efforts in this direction.

In order to answer this question intelligently, and to meet the general demand of the citizens of Massachusetts for exact information concerning the progress made in this important branch of the work, the State Forester, to whom by an act of the last General Court was given the superintendency of work against the gypsy and brown-tail moths, has devoted considerable time to an investigation of the parasite work, to determine, if possible, if everything is being done which can reasonably be expected along this line. As a result of that investigation, taking into consideration the difficulties in importing, breeding and disseminating foreign insects, as well as the long time required for them to become established under the most favorable conditions, I am fully convinced that the progress made thus far shows very gratifying results, and expectations for the future certainly justify a continuance of the work with unabated vigor.

The importation and breeding of the *Calosoma sycophanta* beetles, of which much has been said in previous reports, has

been continued during the past year with very gratifying results. In the fall of 1908 a stock of adult beetles was placed in hibernation at the laboratory, and about the 1st of June, 1909, the work of rearing larvæ for field colonies was begun. This work was so successful that it was possible to liberate 6,100 larvæ during the season. The places selected for these plantings were in woodland areas badly infested with the gypsy moth, extending as far north as Gloucester, Manchester and Essex, as far south as Quincy and as far west as Concord.

The total number of colonies planted were 33, 32 in the larval stage, and 1 colony of adult beetles which were imported. Observations made of the colonies planted in previous years revealed a very satisfactory increase, and in some sections it was found that the beetles had spread over several square miles. To guard these beetles from the danger of being destroyed by people unfamiliar with their appearance, the State Forester caused warning notices, bearing pictures representing the insect in the several stages of its life history, to be posted in libraries, post-offices and school buildings throughout the moth-infested area of the State, and it is his purpose to issue cards in the near future, showing the insects in their natural colors. Efforts will be made the coming season to materially increase the numbers of these valuable insects, by importation and breeding.

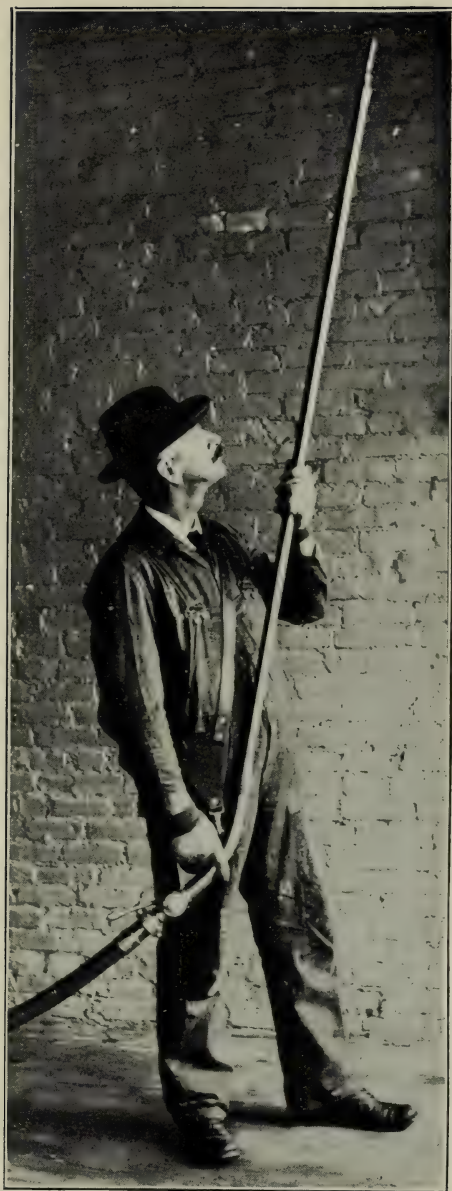
The following information on five important insects in which we already have great faith in establishing a balancing condition of the gypsy moth in Massachusetts, has been given me by Mr. W. F. Fiske of the laboratory: —

Anastatus bifasciatus. — This insect parasite attacks newly deposited eggs of the gypsy moth during the brief interval which elapses before the embryonic caterpillars develop. Its eggs are deposited singly, one in each individual egg of the host, and its larvæ feed upon the substance of the host himself, and become full-fed in about three weeks. They then enter on a long resting stage, snugly ensconced within the limited confines of the shell, and do not resume activity until the middle of the following summer, ten months later. The transformations to pupa and adult follow in the course of two or three weeks following, and the latter emerge, and in a few days are ready to deposit eggs for another generation within the newly deposited eggs of the next generation of the gypsy moth. There is thus but one generation of the parasites each year, and its life cycle, which corresponds to

the annual cycle, is correlated exactly with that of the insect which serves as its host. Encouraged by the knowledge that there was an egg parasite which could be secured through a winter importation of eggs,—a fact which was far from being established up to the rearing of the first specimens of *Anastatus*,—larger importations from various localities were made during the winter of 1908 and 1909. From some of the shipments by far the largest number of parasites ever received from any source was secured, there being nearly 90,000 all told. These 90,000 were liberated in 5 colonies, quite widely separated, within the infested area. In each instance they attacked freshly deposited eggs of the gypsy moth with avidity, and multiplied in the field under perfectly natural conditions. At the present time there are many colonies of larvæ of the parasites hibernating in the open in the immediate vicinity of the colonies, exactly as they would do in their native land, and there cannot be any question that they will issue next summer in the normal manner.

Another egg parasite, *Schedius kavanaughi*, is one which will be described at length in a bulletin soon to be issued. There were 26,000 liberated in September and October. After September the bulk of these were reared for extensive propagation work at the laboratory, and at the present time a conservative estimate of the number in various stages in the reproduction cages is 2,000,000. It is by no means sure that the species will be carried through the winter as successfully as is hoped will be the case, but no obstacle threatens to prevent the liberation of parasites during the summer of 1910. The prospect seems bright for the establishment of strong colonies in each city and town in the infested district during the coming summer, and, if the same rate of dispersion indicated during the past fall continues, and the parasite demonstrates its ability to exist under American conditions during the entire year, it should be generally established in the infested area in two or three years more.

Glyptapanteles fulvipes.—This parasite deposits its eggs beneath the skin on the caterpillars at any stage from the first to and possibly including the last. The larvæ hatching from the eggs become full grown in from two to three weeks, and then work their way out through the skin of the still living caterpillar within the body of which they have fed. Each spins for itself immediately afterward, for its better protection during its later stages, a small white cocoon. The unfortunate victim of attack does not as a rule die immediately, but it never voluntarily moves from the spot. Its appearance both before and after death, surrounded by and seeming to brood over the cocoons, is peculiar in characteristic, and once seen can never be mistaken. There is ample opportunity for two generations annually of the parasites from one generation of the gypsy moth. This is the rule in the countries to which it is native, and it is to be expected in America.



Long woodland nozzle with strap attached, shut-off and shoulder strap, designed by State Forester's department for high, solid, straight stream spraying.

Blepharipa scutellata is a very important parasite of the gypsy moth in Europe, and in western Europe appears to be very much more destructive than does the *Glyptapanteles*. For the first time since the inception of the parasite work large numbers of living puparia, containing the immature maggots of these parasites, were received at the laboratory, and it was possible to allow the formation of the puparia under natural conditions in the earth. A very large number of parasites were secured in this manner (25,000 is a conservative estimate), and several thousands of maggots were allowed to enter the earth in the open in forests infested by the gypsy moth.

Examination has demonstrated the fact that the maggots pupated in a perfectly natural manner, and the condition of pupæ at the present time is far and away more satisfactory than it has ever been before at this season of the year. It is almost impossible to conceive of conditions which will prevent the emergence of these flies in large numbers in the open the coming spring.

Monodontomerus aerus.—This parasite attacks and destroys the freshly formed pupæ of the gypsy and brown-tail moths by depositing eggs on the inside. These eggs hatch, and the larvæ feed and subsequently undergo all of their transformations within the pupa shell, of which they usually consume the entire contents. This parasite was first imported and liberated in 1906, and multiplied so rapidly in the field that it is now known to be distributed over an area of approximately 3,000 square miles.

Owing to the fact that it is my intention to issue in the near future a bulletin treating at length of the large number of foreign insects that have been imported and experimented upon, as well as describing in detail the work being done at the laboratory, I have mentioned here only those imported natural enemies of the gypsy and brown-tail moths that close observation in the field leads the government experts to believe are now well established, and that give promise of becoming important factors in checking the pests we are engaged in fighting. In addition to these, many other species have been imported and liberated; and, notwithstanding the fact that up to this time we have no evidence of their survival, this cannot be considered conclusive, as history records several instances of the introduction of foreign insects which apparently died out, but after a long lapse of time suddenly became noticeable and did very effective work.

In closing my report on this important branch of our work,

I desire to impress upon the tax payers and citizens of Massachusetts that, while the outlook for ultimate success seems bright, they must not expect immediate and sweeping results, as these natural enemies will of necessity be slow in demonstrating their effectiveness, — just how long, no man can determine with any degree of certainty. We have, as an example of the multiplication and spread of a foreign insect, the gypsy moth itself, which had been in this country nearly twenty years before it became abundant enough to attract general attention. Therefore, it must be quite obvious to all who give it any thought that, although many of the parasites multiply prodigiously, it will require several years for them to become numerous enough to serve as a material aid in suppressing the gypsy and brown-tail moths.

Incidentally, it may be said that there is a parasite working upon the elm-leaf beetle, which ultimately promises very good results.

I desire to express my grateful appreciation of the conscientious efforts of the expert men from the United States Bureau of Entomology, who have been engaged in this experimental work, — Mr. W. F. Fiske, who has had charge of the laboratory work since 1907; Mr. A. F. Burgess, to whom was assigned the work on predaceous beetles; Mr. C. H. T. Townsend, who has conducted the experiments on the Tachinid parasites; as well as Mr. F. H. Mosher of the State department, who has been connected with the laboratory since its establishment in 1905. These men, together with their able corps of assistants, are entitled to a great deal of praise for their untiring efforts to attain success.

PARASITE APPROPRIATION.

This appropriation has been used during the year for importing larger numbers of parasites into this country than ever before. Both the importations from Japan and Europe have not only been larger, but were received in far better condition. Prof. Trevor Kincaid, the same gentleman whom we sent to Japan with such good results last year, was commissioned to go to Russia and other European points this past season in quest of parasites. The results of this trip were not, on the whole,

as satisfactory in point of securing material as was the Japan trip; however, it is yet early to predict.

The State Forester has not hesitated to make expenditures from the appropriation where the probability of securing desirable results seemed to warrant them. The total expenses incurred in this work during the year 1909 are as follows:—

Balance from 1908,	\$18,930 09	
Appropriation of May 19, 1909,	15,000 00	
	<hr/>	\$33,930 09
Expenditures:—		
Wages of employees,	\$8,705 73	
Travelling expenses of employees, . .	2,493 77	
Rent,	369 00	
Supplies,	1,749 65	
Stationery and postage,	165 55	
Printing,	34 25	
Sundries,	806 16	
Importation of parasites,	8,075 52	
	<hr/>	22,399 63
Balance Nov. 30, 1909,		\$11,530 46

REPORT OF DR. L. O. HOWARD, CHIEF OF THE BUREAU OF ENTOMOLOGY, WASHINGTON, D. C.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY, WASHINGTON, D. C., Dec. 29, 1909.

Prof. F. W. RANE, *State Forester, 6 Beacon Street, Boston, Mass.*

SIR:—I have the honor to submit a brief report of the share of the Bureau of Entomology in its co-operative effort with the State of Massachusetts to import foreign parasites of the gypsy and brown-tail moths into Massachusetts during the period since I submitted my report to Mr. L. H. Worthley, Jan. 4, 1909, and which has been published in Public Document No. 73 of the State of Massachusetts.

Respectfully yours, L. O. HOWARD, *Chief of Bureau.*

Before beginning a brief account of the operations carried on, the writer desires to express his entire satisfaction with the outcome of the co-operation between the State and the United States Department of Agriculture. The relations between the persons engaged in this work in both branches have been of the most cordial character; the understanding has been perfect. The work of the experts of the Bureau has been facilitated in the most intelligent and courteous way by

the officials engaged in the State work, and it is difficult to conceive of any arrangement which, on account of this intelligent and cordial co-operation, could have been better arranged to bring about the important results expected.

The foreign work for the season was planned during the winter of 1908-09, and instructions were given, so far as possible by correspondence, to European paid and voluntary agents. Brown-tail nests containing parasites were imported from many parts of Europe, and active laboratory work was carried on at Melrose Highlands, in the course of which, largely through the ingenuity of Mr. Fiske, many new points of practical importance were developed. In addition to brown-tail nests, egg masses of the gypsy moth were imported during the winter and spring, and from especially large numbers of these egg masses sent from Hungary by Prof. Josef Jablonowski there were reared an astonishing number of an important species of egg parasite.

Realizing from past experience the comparatively unsatisfactory results which follow in this particular work from correspondence alone, even with highly trained and most intelligent observers, as compared with personal conversations, in which doubtful points can be considered at length, the writer in May and June visited Europe for the purpose of forwarding the work. As shown in the last report, it had not been considered necessary for him to visit Europe in 1908, and the funds thus saved were devoted largely to the organization by Prof. Trevor Kincaid of a parasite service in Japan, which has been described in the previous report so far as its results for the summer of 1908 were available at that time. On the present trip the writer started forwarding agencies for parasites at Cherbourg, France (a much more convenient and surer locality than the 1908 station at Rennes), and at Hamburg, Germany. He arranged at the former place with the authorities of the University of Rennes to have Mr. A. Vuillet of Rennes, agent of last year, stationed at Cherbourg during the shipping season, and through him were forwarded all parasitized material coming from France, Switzerland, Holland and Italy. At Hamburg the United States Express Company was constituted the forwarding agent for the service, with the expert advice of Dr. L. Reh of the Hamburg Museum, to act in case of broken packages or damaged material of any kind. Agents and officials were then visited in Holland, Germany, Russia, Austria, Hungary, Switzerland, and again in France. The European situation was thoroughly studied, and the result of the trip was the securing of largely increased sendings of parasitized material from many points.

In the autumn of 1908, after Prof. Trevor Kincaid's return from his very successful trip to Japan, the writer visited Seattle, Wash., in the course of an official trip to the coast, and discussed with Professor Kincaid the advisability of a second expedition to Japan dur-

ing the summer of 1909. Although his trip had been of such an agreeable nature as to make him greatly desire a good excuse for a second trip, Professor Kincaid, nevertheless, was of the opinion that the Japanese government and the Japanese entomologists had shown such a great courtesy and such a profound interest in the work that it would not be necessary to send an American agent again, but to throw the work upon the courtesy of the Japanese. Therefore, after a preliminary correspondence between the Secretary of Agriculture of the United States and the Minister of Agriculture of Japan, Prof. S. I. Kuwana was designated by the Japanese government to be its official representative in the work to be carried on in Japan during the summer of 1909, and he was directed to place himself in correspondence with the writer. Professor Kincaid's assurances and the writer's expectations have been abundantly justified. Professor Kuwana, a man of already established high reputation, has shown himself in the work to be one of the highest order of intelligence and resourcefulness and of indomitable energy and perseverance, and his work for the summer resulted in the receipt of material of large value at the Melrose Highlands laboratory. The warm thanks of the United States government and that of the State of Massachusetts should be given to the Japanese government and to its agent, Professor Kuwana.

As a result of the writer's trip to Russia in 1907, a service was established in that country which resulted in the securing of interesting material from Prof. W. Pospelow of Kieff, from Dr. Isaac Krasiltechik of Kishinieff and from Prof. S. Mokschetsky of Simferopol, all of whom have official connections with the Ministry of Agriculture and Forestry at St. Petersburg. This material continued to arrive during the summer of 1908, and, as there were reared from it certain parasites which seemed of considerable potential value, but which, on the other hand, were not received in the best possible condition, it was considered desirable to send an American agent to Russia during the proper season of 1909, for the purpose of endeavoring to secure more material, in better condition. Professor Kincaid, on account of the success of his 1908 expedition to Japan, was requested to do this work; and, securing leave of absence from the University of Washington, through the courtesy of its president, he sailed for Europe in April. He was cordially received by the Russian government, whose permission for the visit had been granted in advance, and after consultation with the officials located himself for the best part of the rearing season in favorable locations in Bessarabia, continuing sendings, which, however, on the whole were disappointing in their character on receipt at Melrose Highlands. The problem of securing in New England material from Russia in the best possible condition has not yet been solved.

The best material was received from France. Upon his arrival in Paris, on the 13th of May, the writer met by appointment Mr. René

Oberthür of Rennes, a French entomologist of the highest standing and one of the world's great amateur collectors, and certain of his collaborators. Mr. Oberthür has taken up this work voluntarily as a private citizen of France, wholly without compensation, and entirely from his scientific and practical interest in a great piece of experimental work. The warm thanks of the United States and particularly of the New England States are due to this remarkable man. Plans were considered, largely at his suggestion, which resulted in the establishment of a very large-scale service, principally in the south of France, and in the employment of a large number of collectors under expert supervision. Through this arrangement several thousands of boxes of excellent material were received at the Melrose Highlands laboratory from the south of France. In quantity it exceeded the total of all other importations made since the beginning of the work, and from it have been reared a greater number of Tachinid parasites than have been reared from all other importations of this kind put together.

As a matter of course, quantities of miscellaneous material have been received as formerly from numerous paid and voluntary collectors in the other countries mentioned in an earlier paragraph. On the American side the organization of the laboratory has continued as outlined in the last report. In the autumn Prof. C. H. T. Townsend was given an eighteen-months leave of absence, to enable him to accept a temporary employment with the Peruvian government; but his work has been continued by expert assistants, under the supervision of Mr. Fiske.

During the season there have culminated in a remarkable manner the results of the experience, hard work and experimental efforts of the previous years; methods have been bettered and insight has been gained not only into the habits of the different species, but into important matters like modes of dispersal, which place the attempt upon a very satisfactory basis, and which enable more positive predictions than the workers have been heretofore inclined to make. During the autumn a more extensive effort than previously was made to determine exact field conditions. This involved extensive scouting over large territories, and the dispersal of several important species has been found to have been much more extensive than had even been hoped. The general features of this work will shortly be published in a bulletin by Mr. Fiske, to be issued from the office of the State Forester; and a more detailed consideration of the whole situation is under preparation, under the dual authorship of the writer and Mr. Fiske, which will appear as a bulletin of the Bureau of Entomology. Plans for next year's campaign are already advanced.

FUTURE WORK.

The work to be done during the fiscal year 1910 against the gypsy and brown-tail moths by cities and towns should be carried on along similar lines and methods as last year, but with a clearer and more definite comprehension and understanding of it. It may be advisable in winter work against the pests to give the gypsy moth the preference, as its ravages are much more severe. In cases where the infestation is in outlying districts and in large orchards, where owners are receiving great financial benefit from the work, it is generally conceded to be the owner's duty to remove the brown-tail webs from his trees; but it is best to allow the town forces to care for the gypsy moth egg clusters, where the owner is not familiar with the treatment of them. Woodland work should be made of a protective nature, as far as possible. Where woodland work is necessary, it should be done along scientific forestry lines.

The use of tanglefoot should be given the preference over burlap where it is possible, except on street trees; but even on street trees it may be used to advantage in urgent cases. Where trees are near stone walls and fences which are badly infested with the gypsy moth egg clusters, the trees should be tanglefooted as early as is practicable in the spring, and in that way the caterpillars driven to seek food farther away from their hiding places in the wall and fences, the infestations thus becoming lighter and more scattering. Also in the congested residential sections of cities and towns, where conditions are unsanitary and estates badly infested (bad spots in which to get thorough work from employees), tanglefoot should be applied to shrubs and trees, and thus the caterpillars be driven to other places for food, or starved to death. This will be found to be a very economical plan. In using tanglefoot, it is very necessary that it be combed a few times during the season, as this keeps the surface sticky. There have been some places where tanglefoot has been thought injurious, but thus far this office has not been able to authenticate any such cases. However, it is well to beware of sticky materials that have not been tried and proved to be harmless.

Great care must be taken at the beginning of the spraying season to choose the places where spraying will be most effective. We must always bear in mind that one method must follow another, in order to make our work show results; for, as it has been determined that no one parasite can keep the gypsy moth in check, so also no one method alone will prove effective in suppressing the insect pests.

We must take into consideration at this time that our law does not include work against the elm-leaf beetle, and our apparatus should not be used in fighting this pest, as the law does not authorize any expenditure on this account. Local gypsy moth superintendents who are also tree wardens should bear this in mind, and see that a special appropriation is made to cover such work.

PROPOSED AMENDMENT TO GYPSY AND BROWN-TAIL MOTH LAW.

Section 5, chapter 381, Acts of 1905, should be amended by striking out the last paragraph, beginning, "In case of emergency," etc., and substituting for it the following paragraph: —

The state forester may assess cities and towns for such an amount as they may be required to expend by the provisions of this act, or for such part of it as he may think necessary, the amounts thus assessed to be returned to the state treasurer after sixty days, and credited to the appropriation for carrying out the provision of this act. The work to be done in such cities and towns shall be under the direct supervision of the state forester.

The reasons for asking for the above amendment are as follows: —

More efficient work could be done in various outside towns, where the infestation is not severe enough to warrant the keeping of a permanent force all the year round, if the necessary work should be done under the direct supervision of this office, by a permanent force made up of picked men from the several towns in which the work is to be done. In such places it has been the custom to employ men for not more than four months in the year, and therefore it was necessary to break in new men each season. These new men of course cannot do as efficient work as experienced men.

This amendment would also enable us to do work in towns where appropriations cannot be made at the beginning of our fiscal year, which is December 1; the fiscal year of most towns begins January 1. In some towns and cities appropriations have been delayed and the work stopped, with serious consequences. Thus, in towns or cities where appropriations are not available, this office could take up the work with a competent force of men, carrying it on until such time as the city or town authorities were ready to continue it. The town or city would be assessed the total amount spent, and this amount paid in to the State Treasurer and credited to this office.

In cases where there is delay over the selection of the local superintendent, this amendment would give this office the right to step in and carry on the work until such time as the authorities should appoint a competent man to go on with the work.

THE ELM-LEAF BEETLE.

In recommending an appropriation for elm-leaf beetle work, we feel in many cases it could advantageously be combined with our work against the gypsy and brown-tail moths. In using arsenical poisons against leaf-eating insects there are certain times during the spring season when best results are obtained, and this time for spraying is the same for the elm-leaf beetle as for the gypsy moth. It would necessitate in many places the purchase of more apparatus, but the work would be done with greater thoroughness.

One thing, however, is certain: we should not include the elm-leaf beetle spraying with the moth work, unless an appropriation is made, sufficient to take care of it. We should not be handicapped in the moth work, particularly in the coming year, just when we are prepared to accomplish effective results, provided the usual appropriations are made. The elm-leaf beetle, it must be remembered, is found not only throughout the eastern part of the State, where the moth work is confined, but over the whole State, and it needs extra financial assistance to handle it.

DEAD TREES SHOULD BE CUT AND UTILIZED TO MINIMIZE INSECT TROUBLES.

Trees that have died from any cause whatever should be dug up, or cut down and used. This is particularly advisable where there are trees of the same species. The reason for this is the great unbalancing of nature. There are many insects that live under the bark or bore into dead trees, which never trouble us. However, under favorable conditions they multiply so fast that they are likely to confine their work not to dead trees alone, but will doubtless attack live trees, thereby doing great damage. These insects are usually found just inside the bark; hence, if the bark is stripped off and burned any time before April, they would be destroyed. It is hoped that our people will keep this suggestion in mind, and practise it as much as possible. The cities of Cambridge and Somerville, for example, should cut and destroy the bark on the dead elms this winter; and where trees have been killed by the gypsy or brown-tail moths, they should be cut and utilized at once. Not only will it reduce the possible danger, but the product itself will be more valuable.

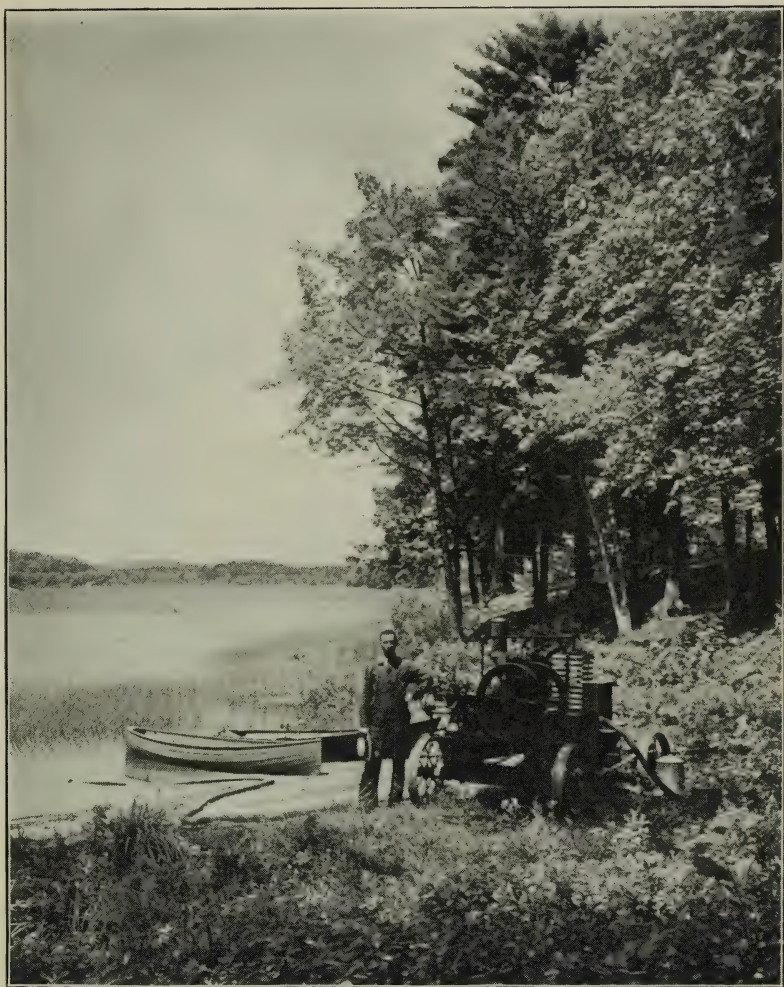
MODERN FORESTRY AND INSECT WARFARE.

The more the subject of modern forestry is studied, the clearer is it shown that if forestry practice was carried on as it should be for economic results, the great expense we now are compelled to make in fighting insect pests like the gypsy moth would be reduced to a minimum.

Where gypsy moths give us the greatest trouble is in wild neglected woodlands, and in thickets and tangles found along the highways or on illy kept estates.

One thing which our people cannot help but recognize is, that where modern methods have been practised through thinning and exercising some sort of management for the good of the trees, here conditions are not as bad as elsewhere. Then, again, under the latter management should the infestation increase, the conditions are so much more favorable that the expense of warfare against the pest is greatly reduced.

It is really possible that the gypsy moth scourge may cause



Gasoline force pump used in woodland spraying, furnishing water 1,000 to 1,500 feet from spraying machine, pumping 400 gallons in eleven minutes.

certain sections to practise modern forestry, and thereby in the end gain financially in getting a better forest product, both in volume and quality, than would have happened had the insects never appeared.

From the experience already gained we have demonstrated that where we have a clean stand of pine the forest can easily be protected against the gypsy moth. There are few species of forest products worth more than white pine to grow commercially at present here in Massachusetts. What is true of the pine is more or less true of other evergreens; hence, in the territory infested by the gypsy moth it is good forestry to grow these species.

The first thing to be done with all woodlands, therefore, is to practise modern forestry management for the benefit of future products, regardless of gypsy moths or other depredations; then, let come what may, conditions are of the best to overcome them.

There is little to be gained in treating egg clusters and combating moths on dead or ill-shaped and weed trees and stumps, as one's efforts ought to be centered on those that have prospective value.

We recommend, therefore, that every one begin at once to practise modern forestry management, and then the insect warfare will be greatly reduced.

FINANCIAL STATEMENT.

General Appropriation.

In our financial statement, given below, we show a balance of \$4,143.05. This balance will be disbursed during the current month in reimbursements to towns and cities which have not yet returned final papers of the year's expenditures to this office. There are, as usual, a number of dilatory municipalities, from which it is almost impossible to get returns at the proper time.

Balance from 1908,	\$1,223 37	
Appropriation for 1909,	150,000 00	
Amount returned by town of Winchester,	297 06	
Amount returned for tools lost,	8 40	
Appropriation of May 19, 1909,	150,000 00	
	<hr/>	\$301,528 83

Office expenses:—

Salaries of clerks,	\$2,429 00
Rent,	1,801 67
Stationery and postage,	884 53
Printing,	497 46
Experts,	95 24
Supplies and furniture,	443 20
Sundries,	1,168 93
Educational work,	45 61

Field expenses:—

Wages of employees,	35,823 55
Travelling expenses,	11,852 98
Supplies,	3,048 97
Special work in parks, etc.,	22,521 50
Supplies for experiment,	7 71
Sundries,	165 25
Reimbursement to cities and towns,	216,600 18

\$297,385 78

Balance on hand Nov. 30, 1909, \$4,143 05
Analysis of Town Expenses.

In the table below we show the apportionment of town expenses in the 98 cities and towns receiving reimbursement from the State to the amount of \$180,849.13:—

Total amount spent,	\$509,008 06
Private work deducted,	95,626 74

\$413,381 32

Pay roll,	\$290,652 70
Teaming,	22,893 01
Travel,	959 00
Rent,	799 93
Supplies,	91,175 62
Sundries,	4,261 72
Stationery and postage,	1,450 66
Printing,	1,188 68

\$413,381 32*
Financial Summary by Towns.

The following table shows the reimbursement paid to cities and towns for 1907 and 1908, the total net expenditure, the required expenditure before receiving reimbursement and the

amount of reimbursement paid in 1909, and also the required expenditure for 1910. The column for 1908 includes some reimbursements for 1908 which we were not able to give at the time the report for 1908 went to press, as the final papers were not then filed by the towns.

	1907. Re- imburse- ment.	1908. Re- imburse- ment.	1909.			1910. Required Expendi- ture.
			Required Expendi- ture.	Total Expendi- ture.	Re- imburse- ment.	
Abington, . .	—	\$1,493 44	\$1,118 96	\$1,915 24	\$796 28	\$1,175 93
Acton, . .	\$2,257 82	2,485 81	722 99	2,487 26	1,764 27	782 26
Amesbury, . .	—	378 10	2,348 81	2,091 24	—	2,434 83
Andover, . .	1,020 57	2,365 17	2,476 21	6,345 65	3,095 55	2,588 47
Arlington, . .	5,993 94	6,109 09	4,442 02	10,606 09	4,931 26	4,591 97
Ashby, . .	—	—	198 77	17 50	—	212 71
Ashland, . .	326 15	341 24	470 02	519 33	49 31	477 13
Attleborough, . .	—	—	5,000 00	370 30	—	5,000 00
Avon, . .	—	—	377 28	—	—	384 84
Ayer, . .	—	—	815 53	—	—	835 41
Barnstable, . .	—	—	2,277 15	—	—	2,317 10
Bedford, . .	6,040 25	9,466 72	520 30	5,129 15	4,608 85	522 90
Bellingham, . .	—	—	325 46	—	—	335 96
Belmont, . .	3,161 87	572 93	2,431 46	2,636 85	164 32	2,511 51
Berlin, . .	64 87	460 83	223 62	586 57	362 95	221 62
Beverly, . .	1,622 45	1,889 61	5,000 00	6,636 87	818 44	5,000 00
Billerica, . .	3,311 50	6,091 09	909 78	5,148 44	4,238 66	974 32
Bolton, . .	222 38	411 07	198 02	884 67	686 65	199 14
Boston, . .	10,000 00	2,500 00	5,000 00	43,139 39	10,000 00	5,000 00
Bourne, . .	—	1,489 01	1,356 60	2,148 21	791 61	1,641 55
Boxborough, . .	916 28	1,805 43	99 58	1,538 05	1,438 47	106 79
Boxford, . .	1,361 91	2,066 35	479 97	3,323 53	2,843 56	520 74
Braintree, . .	—	1,445 27	2,319 73	—	—	2,421 92
Brewster, . .	—	—	210 63	—	—	246 40
Bridgewater, . .	—	—	1,300 09	1,445 47	143 48	1,328 11
Brockton, . .	—	—	5,000 00	—	—	5,000 00
Brookline, . .	—	—	5,000 00	—	—	5,000 00
Burlington, . .	3,835 94	5,599 44	246 52	2,534 43	2,287 91	250 36
Cambridge, . .	380 50	—	5,000 00	88 78	—	5,000 00
Canton, . .	—	—	1,596 06	600 00	—	1,654 31
Carlisle, . .	3,111 33	5,485 58	176 58	3,126 41	2,949 83	182 89
Carver, . .	96 47	3,641 27	558 34	1,725 98	1,167 64	601 89

	1907. Re- imburse- ment.	1908. Re- imburse- ment.	1909.			1910. Required Expendi- ture.
			Required Expendi- ture.	Total Expendi- ture.	Re- imburse- ment.	
Chelmsford, . .	\$3,016 93	\$3,740 98	\$1,635 35	\$3,693 20	\$2,057 85	\$1,809 64
Chelsea, . . .	-	-	5,000 00	-	-	5,000 00
Clinton, . . .	-	-	3,218 88	2,154 27	-	3,309 63
Cohasset, . . .	226 02	936 40	2,817 53	6,814 73	3,197 76	3,061 17
Concord, . . .	3,521 91	5,169 66	2,551 71	9,046 44	5,195 79	2,716 27
Danvers, . . .	5,446 59	6,441 71	2,352 60	4,871 10	2,318 50	2,404 85
Dedham, . . .	-	-	5,000 00	822 53	-	5,000 00
Dennis, . . .	-	-	475 87	-	-	489 60
Dover, . . .	1,636 79	1,487 56	560 85	3,445 46	2,884 61	2,131 26
Dracut, . . .	397 22	2,462 61	919 20	2,137 25	1,218 05	939 68
Dunstable, . .	698 40	544 67	119 46	1,057 70	938 24	131 58
Duxbury, . . .	908 00	3,381 91	1,025 48	1,776 77	857 39	881 61
East Bridgewater,	752 67	3,945 78	786 16	1,688 43	902 27	831 45
Easton, . . .	-	-	2,031 17	851 76	-	2,115 65
Essex, . . .	1,776 57	2,096 22	436 53	1,536 50	1,099 97	456 91
Everett, . . .	-	-	5,000 00	2,268 40	-	5,000 00
Falmouth, . . .	-	-	3,201 00	-	-	3,243 69
Fitchburg, . . .	-	-	5,000 00	-	-	5,000 00
Foxborough, . .	-	-	883 73	-	-	911 11
Framingham, . .	1,161 04	-	4,035 02	3,396 27	-	4,226 59
Franklin, . . .	-	-	1,476 97	-	-	1,517 82
Gardner, . . .	-	-	2,942 78	-	-	3,071 08
Georgetown, . .	638 94	1,151 67	412 67	2,468 33	2,055 66	410 16
Gloucester, . .	753 14	2,063 54	5,000 00	6,895 12	947 56	5,000 00
Grafton, . . .	-	-	1,069 86	625 52	-	1,067 88
Greenfield, . . .	-	-	3,645 72	-	-	3,853 77
Groton, . . .	-	-	1,235 99	1,432 71 ¹	-	1,515 70
Groveland, . . .	903 70	1,711 10	466 03	2,134 79	1,668 76	465 07
Halifax, . . .	601 15	2,237 83	205 39	1,027 28	821 89	213 70
Hamilton, . . .	2,246 69	3,167 63	1,441 27	2,570 49	1,129 22	1,519 37
Hanover, . . .	1,387 34	4,054 60	577 74	1,866 80	1,289 06	591 95
Hanson, . . .	430 18	1,871 39	511 66	1,203 45	691 79	431 80
Harvard, . . .	-	616 61	481 67	1,230 07	748 40	493 48
Haverhill, . . .	-	1,131 62	5,000 00	5,573 03	286 52	5,000 00
Hingham, . . .	1,994 80	1,877 15	2,307 82	3,307 82	1,000 00	2,441 02
Holbrook, . . .	-	-	567 83	-	-	580 26
Holden, . . .	-	-	600 78	-	-	651 99

¹ No private work submitted.

	1907. Re- imburse- ment.	1908. Re- imburse- ment.	1909.			1910. Required Expendi- ture.
			Required Expendi- ture.	Total Expendi- ture.	Re- imburse- ment.	
Holliston, . .	—	—	\$630 30	—	—	\$663 04
Hopedale, . .	—	—	2,077 55	—	—	2,096 12
Hopkinton, . .	\$166 83	\$810 16	618 44	\$961 93	\$343 49	631 34
Hudson, . .	1,259 63	999 59	1,403 84	1,411 30	7 46	1,570 08
Hull, . .	—	—	2,070 90	—	—	2,161 33
Hyde Park, . .	—	—	5,000 00	2,468 25	—	5,000 00
Ipswich, . .	1,763 08	1,757 80	1,744 32	2,981 01	1,236 69	1,914 70
Kingston, . .	—	861 00	623 16	1,512 80	889 64	640 91
Lakeville, . .	—	—	270 16	—	—	280 54
Lancaster, . .	—	—	1,461 23	—	—	1,656 83
Lawrence, . .	—	—	5,000 00	—	—	5,000 00
Leicester, . .	—	—	944 95	7 00	—	965 45
Leominster, . .	—	—	4,210 52	—	—	4,788 85
Lexington, . .	10,796 87	11,139 99	2,753 87	9,387 09	5,306 58	2,903 12
Lincoln, . .	2,785 69	5,000 00	1,124 13	3,208 31	2,084 18	1,216 10
Littleton, . .	287 44	1,716 01	412 83	1,463 88	1,051 05	428 94
Lowell, . .	—	120 42	5,000 00	3,868 95	—	5,000 00
Lunenburg, . .	—	81 34	422 49	385 39	—	441 06
Lynn, . .	7,748 30	{ 1,133 22 3,084 27 }	5,000 00	2,757 32	—	5,000 00
Lynnfield, . .	3,274 38	2,982 45	311 21	1,841 44	1,530 23	312 84
Malden, . .	2,683 57	—	5,000 00	4,455 17	—	5,000 00
Manchester, . .	—	—	5,000 00	—	—	5,000 00
Mansfield, . .	—	—	1,198 63	—	—	1,580 27
Marblehead, . .	—	—	2,987 21	2,750 59	—	3,101 54
Marion, . .	—	—	1,148 28	—	—	1,763 45
Marlborough, . .	855 44	580 83	4,021 23	4,483 66	369 94	4,128 37
Marshfield, . .	170 37	2,389 25	745 86	1,570 47	824 61	767 20
Mashpee, . .	—	104 77	80 22	519 27	439 05	87 88
Maynard, . .	1,072 06	1,551 28	1,513 59	2,167 89	654 30	1,548 29
Medfield, . .	—	—	617 18	—	—	638 60
Medford, . .	3,117 68	4,006 11	5,000 00	14,681 01	4,000 00	5,000 00
Medway, . .	—	—	538 39	320 66	—	579 19
Melrose, . .	1,354 96	1,500 00 ¹	5,000 00	2,359 70	—	5,000 00
Mendon, . .	—	—	259 38	—	—	291 48
Merrimac, . .	189 40	1,598 02	489 88	1,988 09	1,498 21	498 68
Methuen, . .	1,770 79	3,334 00	2,368 39	4,141 80	1,776 41	2,453 32
Middleborough, . .	—	—	1,811 04	2,188 50	377 46	1,885 95

¹ Special.

	1907. Re- imburse- ment.	1908. Re- imburse- ment.	1909.			1910. Required Expendi- ture.
			Required Expendi- ture.	Total Expendi- ture.	Re- imburse- ment.	
Middleton, .	\$1,591 44	\$2,012 23	\$307 67	\$1,545 12	\$1,237 45	\$316 51
Milford, . .	-	-	2,800 46	-	-	3,485 24
Millbury, . .	-	-	920 07	-	-	917 32
Millis, . . .	-	-	320 32	-	-	398 03
Milton, . . .	-	-	5,000 00	9,700 00	-	5,000 00
Nahant, . . .	-	-	2 373 87	-	-	2,451 60
Natick, . . .	2,928 64	4,613 56	2,899 84	3,669 38	615 63	3,133 48
Needham, . .	364 78	2,443 84	2,262 22	3,516 51	1,254 29	2,322 78
Newbury, . .	1,902 35	5,187 19	499 53	3,705 81	3,206 28	492 99
Newburyport, .	-	-	4,581 48	-	-	4,907 89
Newton, . . .	761 36	2,730 67	5,000 00	36,438 69	8,000 00	5,000 00
Norfolk, . . .	-	-	322 73	-	-	331 80
North Andover, .	-	3,238 23	1,850 27	4,895 35	3,045 08	1,841 44
N. Attleborough,	-	-	2,094 98	525 20	-	2,737 98
North Reading, .	1,915 81	2,757 26	270 66	3,077 94	2,807 28	542 32
Northborough, .	-	-	530 72	-	-	1,744 38
Northbridge, . .	-	-	1,699 24	-	-	280 65
Norwell, . . .	507 41	2,291 57	346 80	1,366 50	1,019 70	367 98
Norwood, . . .	-	-	2,440 26	1,200 00	-	5,000 00
Orleans, . . .	-	-	245 67	-	-	252 53
Oxford,	-	-	747 67	-	-	775 25
Palmer,	-	-	1,629 01	-	-	1,671 17
Peabody, . . .	3,997 42	4,208 67	4,039 62	6,162 57	1,698 36	4,156 73
Pembroke, . .	108 45	1,109 72	388 47	1,180 37	791 90	376 90
Pepperell, . .	-	870 79	895 60	1,641 19	745 59	901 22
Plainville, . .	-	-	299 98	-	-	317 85
Plymouth, . .	-	-	4,179 44	-	-	4,346 09
Plympton, . .	660 07	5,504 87	134 06	1,914 77	1,780 71	150 30
Princeton, . .	-	-	416 55	-	-	438 87
Quincy, . . .	-	1,550 24	5,000 00	5,111 03	55 52	5,000 00
Randolph, . .	-	-	802 52	-	-	826 48
Raynham, . . .	-	70 80	301 45	132 82	-	307 47
Reading, . . .	5,959 66	6,974 30	2,095 45	7,388 90	5,293 45	2,181 77
Revere, . . .	370 90	-	5,000 00	4,702 05	-	5,000 00
Rochester, . .	-	96 34	250 74	349 49	98 75	257 35
Rockland, . .	-	675 17	1,511 99	1,705 21	193 22	1,589 06
Rockport, . .	842 80	800 34	1,276 78	1,517 44	240 66	1,309 19
Rowley, . . .	692 45	1,047 73	299 42	1,326 01	1,026 59	298 94

	1907. Re- imburse- ment.	1908. Re- imburse- ment.	1909.			1910. Required Expendi- ture.
			Required Expendi- ture.	Total Expendi- ture.	Re- imburse- ment.	
Salem, . . .	\$3,914 01	\$2,818 68	\$5,000 00	\$5,668 00	\$334 00	\$5,000 00
Salisbury, . .	1,809 08	2,103 91	359 39	1,649 89	1,290 50	356 54
Sandwich, . .	—	494 08	400 10	528 93	128 83	405 29
Saugus, . . .	13,168 61	12,243 30	2,054 48	9,801 77	7,747 29	2,082 51
Scituate, . . .	—	—	1,661 85	3,013 45	1,351 60	1,790 26
Sharon, . . .	—	—	1,030 79	—	—	1,105 51
Sherborn, . . .	799 05	1,463 82	564 15	1,320 49	756 34	592 24
Shirley, . . .	—	—	439 31	423 90	—	433 69
Shrewsbury, . .	—	—	598 21	—	—	653 07
Somerville, . .	—	—	5,000 00	3,159 21	—	5,000 00
Southborough, .	1,495 95	984 33	706 45	1,812 33	1,105 88	733 56
Springfield, . .	—	—	5,000 00	—	—	5,000 00
Stoneham, . . .	7,996 29	8,052 48	2,010 93	4,648 92	2,637 99	2,021 00
Stoughton, . .	—	—	1,402 83	—	—	1,399 13
Stow,	465 47	773 80	357 22	1,235 74	878 52	375 39
Sudbury, . . .	532 94	2,390 60	497 76	2,048 29	1,550 53	501 99
Sutton,	—	—	492 79	—	—	516 34
Swampscott, . .	980 22	1,509 10	3,997 06	3,910 67	—	4,050 37
Taunton, . . .	—	—	5,000 00	530 57	—	5,000 00
Templeton, . .	—	—	637 93	—	—	634 61
Tewksbury, . .	1,186 76	1,771 69	458 39	2,203 81	1,745 42	508 38
Topsfield, . . .	2,028 50	1,725 26	501 98	1,906 30	1,404 32	508 09
Townsend, . . .	—	—	460 92	396 55	—	469 92
Truro,	—	—	150 96	—	—	149 06
Tyngsborough, .	1,114 74	1,505 38	209 87	2,102 14	1,892 27	223 53
Upton,	—	—	441 12	83 60	—	444 37
Wakefield, . . .	2,268 99	4,297 83	3,441 43	5,249 02	1,446 07	3,635 64
Walpole,	—	—	1,671 86	674 58	—	1,750 25
Waltham, . . .	1,104 73	3,340 13	5,000 00	6,233 19	616 60	5,000 00
Wareham, . . .	—	—	1,508 32	—	—	1,884 49
Warren,	—	—	758 74	—	—	769 59
Watertown, . .	1,264 66	399 36	5,000 00	3,857 51	—	5,000 00
Wayland,	734 02	4,603 00	884 84	3,874 13	2,989 29	937 77
Wellesley, . . .	—	587 42	5,000 00	6,772 15	886 08	5,000 00
Wellfleet, . . .	—	—	392 38	—	—	495 76
Wenham,	2,051 79	1,577 95	935 63	3,912 73	2,977 10	1,007 04
W. Bridgewater, .	638 65	1,342 17	488 69	988 09	499 40	508 54
West Newbury, .	1,158 52	7,316 20	424 49	3,263 13	2,838 64	430 97

	1907. Re- imburse- ment.	1908. Re- imburse- ment.	1909.			1910. Required Expendi- ture.
			Required Expendi- ture.	Total Expendi- ture.	Re- imburse- ment.	
Westborough, .	-	-	\$1,273 09	-	-	\$1,306 06
Westford, .	\$1,701 49	\$2,727 41	700 98	\$2,866 90	\$2,165 92	733 29
Westminster, .	-	-	308 50	205 04	-	314 09
Weston, .	2,938 33	10,541 99	2,711 61	14,606 82	4,600 00	2,733 10
Westwood, .	-	-	926 67	-	-	1,038 27
Weymouth, .	1,060 83	1,542 86	3,093 46	3,469 37	300 73	3,197 19
Whitman, .	-	-	1,896 61	-	-	1,949 34
Wilmington, .	1,897 94	3,803 51	528 36	3,502 59	2,974 23	555 91
Winchester, .	5,059 09	808 08	4,606 56	4,269 87	-	4,988 65
Winthrop, .	-	-	4,303 07	-	-	4,797 44
Woburn, .	4,252 45	7,624 59	4,476 08	11,937 83	5,969 40	4,478 69
Worcester, .	-	-	5,000 00	-	-	5,000 00
Wrentham, .	-	-	476 15	-	-	480 48
Yarmouth, .	-	-	811 96	-	-	834 74

SUMMARY OF RECOMMENDATIONS.

1. To provide funds for establishing lookout stations with telephone connections in various sections of the State, to be used in times of drouth for detection of forest fires.

2. To pass an enactment regulating the use of fire balloons, which are extremely dangerous at times.

3. To enact a law defining the powers and duties of the State Forester with regards to forest fires, and authorizing him to deputize as many State forest wardens as he decrees necessary.

4. The advisability of regulating by law the treatment of the slash or brush resulting from lumbering or the cutting down of trees or brush, in order to lessen the future damages from fires.

5. The regulation and systematizing of the prices paid for fighting fires in different towns.

6. That the State offer, through the State Forester, to reimburse towns 50 per cent. for an expenditure for forest fire fighting equipment, or in making forest fire protection belts, to an amount not to exceed \$250 for each town thus accepting such aid.

7. That the work of suppressing the elm-leaf beetle be placed under the State Forester, and subject to the same laws as now

govern the moth work, provided that sufficient funds are allowed to carry on the work.

8. That the local moth superintendents in towns and cities be appointed in a similar way as the forest wardens are appointed at present.

9. That the gypsy and brown-tail moth law be so amended that the State Forester may take supervision in cities and towns so desiring it, or where the conditions demand it.

10. That the work of the tree wardens in towns be subject to the approval of the State Forester.

11. That the State Forester be allowed sufficient funds for an assistant, whose duties will primarily be to master the forest fire problem throughout the State.

12. That the usual additional appropriation for gypsy and brown-tail moth suppression, which has been \$165,000, be again made this year; and that an appropriation of \$100,000 be made for handling the elm-leaf beetle, provided this work be placed under the State Forester; and that an additional appropriation of \$15,000 be made for carrying on the forestry department work as outlined; total, \$280,000.

13. That the State Forester be authorized to accept gifts of lands or funds on behalf of the Commonwealth, with the understanding that all net sales from the management therefrom shall be used by him for improving State forestry conditions, subject to the approval of the Governor and council.

14. It is of great importance, in order to make definite plans and to accomplish the best results, that the State Forester's appropriations be made available by the first of March. If it is decided by that time, we shall be in readiness to do effective work early in the spring, and the same amount of money will go much farther in controlling both insects and forest fires.

Respectfully submitted,

F. W. RANE,
State Forester.

THE STATE FORESTER

OF
MASSACHUSETTS.

SEVENTH ANNUAL REPORT.
1910.

F. W. RANE, STATE FORESTER.



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THE STATE BOARD OF PUBLICATION.

The Commonwealth of Massachusetts.

To the General Court.

The State Forester takes pleasure in presenting this, his seventh annual report, enumerating the activities, accomplishments and expenditures of the past year, with recommendations for the future needs of the department.

As in the preceding year, the report is divided into two parts: —

Part I. General Forestry.

Part II. Gypsy and Brown-tail Moth Work.

This report is submitted in accordance with the provisions of chapter 409, section 5, Acts of 1904.

Respectfully submitted,

F. W. RANE,

State Forester.

DEC. 1, 1910.

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The Massachusetts State Forester and staff. By the use of an automobile from the main office, and having the division superintendents supplied with motor cycles, the work is now more efficient with twenty men than heretofore with fifty-four.

The Commonwealth of Massachusetts.

SEVENTH ANNUAL REPORT OF THE STATE FORESTER.

INTRODUCTION.

Forestry work during the past year has received its due share of interest on the part of our Massachusetts people. It is a pleasure to be able to report that in general the forestry and moth work have so amalgamated that not only more efficiency but greater economy is the result.

The depredations of insect pests, fungous diseases and forest fires must be successfully dealt with and controlled if we are to succeed in establishing and maintaining a modern forestry system throughout this Commonwealth.

From the first the forestry work has been popular, while the moth work, on the other hand, has savored of unpopularity, for many reasons, but chiefly because of the law requiring property owners, through taxation, to defray a portion of its expense.

It has taken time to organize and perfect the work of combating the gypsy and brown-tail moths. It is believed to be a conservative estimate when we say that we have increased our efficiency toward moth control fully one-third during the past season, and without additional appropriations.

It has been the earnest endeavor of the State Forester, since the moth work has been placed under his care, to overcome, if possible, anything that has a tendency to create a misunderstanding, and also to secure legislation that would meet definite requirements and hence general public approval.

The legislation enacted by the last General Court has already proved of great assistance, and it is hoped that our requests as outlined at the conclusion of this report will meet with the favorable consideration of your honorable body.

It is believed that there are few departments in the State that have a more enthusiastic, self-sacrificing and loyal corps of employees than has this one. "A live-wire organization" is our slogan.

The demands upon the office of the State Forester for examinations and advice on forestry matters have been greater than ever; also, forestry literature, lectures and demonstrations have been constantly requested throughout the year. Fire-warning notices and forest-law posters have been generally distributed and are in greater use than ever.

The growing interest in equipping our towns with some modern fire-fighting apparatus is certainly encouraging. The legislation of last year, whereby the poorer towns receive State aid, has been of great assistance. The comparative efficiency of towns with and without equipment for fighting forest fires during the past season is proverbial. Towns with equipment were practically free from fires, while those without such equipment were largely burned over.

The reforestation work is extremely popular, and it is believed that the State can well afford to enlarge the appropriation for this work, as under our present method the State cannot possibly lose.

The State Forester feels frank to say that the outlook in this department was never brighter.

ORGANIZATION.

The same general plan of organization as that outlined last year has been continued throughout the season. Our constant aim has been toward greater efficiency and raising the standard of the work. Our purpose is to encourage cities and towns to first secure competent forest wardens and moth superintendents, and then to desist from constant changes. It takes time to get a man well broken into the work, and thereafter he is of the greatest value.

The present organization of the State Forester's staff is as follows:—

STAFF.

Mr. F. W. RANE, B.Agr., M.S.,	. State Forester.
Mr. L. H. WORTHLEY, .	. Assistant Forester, in charge of moth work.
Mr. H. O. COOK, M.F.,	. Assistant Forester, in charge of forestry management.
Mr. R. S. LANGDELL, .	. Assistant Forester, in charge of nursery work.
Mr. H. F. GOULD, M.F.,	. Assistant Forester.
Mr. J. H. POTTS, ¹	. Assistant, forest fire work.
ALDEN T. SPEARE, .	. Assistant, moth disease work.
Mr. CHAS. O. BAILEY, .	. Secretary.
MISS ELIZABETH HUBBARD, .	. Clerk, in charge of accounts.
MISS CHARLOTTE JACOBS, .	. Clerk, in charge of mail and office.
Mr. WM. A. HATCH, .	. Division Superintendent, Division 1, as follows: Danvers, Hamilton, Ipswich, Lynn, Lynnfield, Nahant, Peabody, Revere, Salem, Swampscott and Wenham.
Mr. JOHN W. ENWRIGHT, .	. Agent, Division 2, as follows: Arlington, Bedford, Burlington, Carlisle, Everett, Lexington, Malden, Melrose, No. Reading, Reading, Saugus, Stoneham, Wakefield, Wilmington, Winchester and Woburn.
Mr. GEORGE A. SMITH, .	. Agent, Division 3, as follows: Belmont, Boston, Brookline, Cambridge, Chelsea, Concord, Hyde Park, Lincoln, Medford, Natick, Needham, Newton, Somerville, Waltham, Watertown, Wayland, Wellesley, Weston and Winthrop.
Mr. FRANK A. BATES, .	. Agent, Division 4, as follows: Abington, Avon, Braintree, Cohasset, Hingham, Holbrook, Hull, Milton, Quincy, Randolph, Rockland, Scituate, Weymouth and Whitman.
Mr. FRANCIS C. WORTHEN, .	. Division Superintendent, Division 5, as follows: Amesbury, Boxford, Georgetown, Groveland, Merrimac, Middleton, Newbury, Newburyport, Rowley, Salisbury-Topsfield and West Newbury.
Mr. JOHN J. FITZGERALD, .	. Division Superintendent, Division 6, as follows: Andover, Billerica, Chelmsford, Dracut, Haverhill, Lawrence, Lowell, Methuen, North Andover and Tewksbury.
Mr. WM. W. COLTON, .	. Division Superintendent, Division 7, as follows: Ashby, Ashburnham, Ayer, Dunstable, Fitchburg, Groton, Lunenburg, Pepperell, Shirley, Townsend, Westford and Westminster.
Mr. CLARENCE W. PARKHURST, .	. Division Superintendent, Division 8, as follows: Bellingham, Canton, Dedham, Dover, Foxborough, Framingham, Franklin, Medfield, Medway, Millis, Norfolk, Norwood, Plainville, Sharon, Sherborn, Stoughton, Walpole, Westwood and Wrentham.
Mr. CHAS. W. MINOTT, .	. Agent, Division 9, as follows: Acton, Berlin, Bolton, Boxborough, Clinton, Harvard, Hudson, Lancaster, Leominster, Littleton, Marlborough, Maynard, Sterling, Stowe and Sudbury.

¹ Resigned.

- Mr. GEORGE A. SANDS, . . . Division Superintendent, Division 10, as follows: Ashland, Blackstone, Grafton, Holliston, Hopedale, Hopkinton, Mendon, Milford, Northborough, Northbridge, Southborough, Upton, Uxbridge and Westborough.
- Mr. HARRY B. RAMSEY, . . . Agent, Division 11, as follows: Athol, Auburn, Barre, Boylston, Brookfield, Charlton, Douglas, Dudley, Gardner, Holden, Hubbardston, Leicester, Millbury, Orange, Oxford, Paxton, Petersham, Phillipston, Princeton, Rutland, Royalston, Spencer, Sturbridge, Sutton, Templeton, Webster, West Boylston, Winchendon and Worcester.
- Mr. JOHN A. FARLEY, . . . Agent, Division 12, as follows: Carver, Duxbury, Halifax, Hanover, Hanson, Kingston, Marshfield, Norwell, Pembroke, Plymouth and Plympton.
- Mr. LEWIS W. HODGKINS, . . . Agent, Division 13, as follows: Attleborough, Bridgewater, Brockton, East Bridgewater, Easton, Lakeville, Mansfield, Middleborough, North Attleborough, Raynham, Taunton and West Bridgewater.
- Mr. JOHN F. CARLETON, . . . Division Superintendent, Division 14, as follows: Barnstable, Bourne, Brewster, Dennis, Falmouth, Marion, Mashpee, Orleans, Rochester, Sandwich, Truro, Wareham, Wellfleet and Yarmouth.
- Mr. SAUL PHILLIPS, . . . Division Superintendent, Division 15, as follows: Beverly, Essex, Gloucester, Manchester, North Shore Woodlands and Rockport.

CO-OPERATIVE SCIENTIFIC STAFF.

- L. O. HOWARD, Ph.D., . . . Chief United States Bureau of Entomology, Washington, D. C., *Parasites and Predaceous Insects*.
- THEOBALD SMITH, Ph.B., M.D., . . . Professor of Comparative Pathology, Harvard University, *Diseases of Insects*.
- ROLAND THAXTER, Ph.D., . . . Professor of Cryptogamic Botany, Harvard University, *Fungous Diseases affecting Insects*.
- E. L. MARK, Ph.D., LL.D., . . . Director of the Zoölogical Laboratory, Harvard University, *Protozoa and Insect Life*.
- W. M. WHEELER, Ph.D., . . . Professor of Entomology, Harvard University, *Experimental Entomologist*.
- C. H. FERNALD, Ph.D., . . . Professor of Entomology, Massachusetts Agricultural College, *Consulting Entomologist*.
- FRANK H. MOSHER, . . . Entomologist in charge of laboratory.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS.

[Alphabetically by towns.]

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Abington, . . .	287	B. E. Wilkes, chief fire department, . . .	C. Frederick Shaw.
Acton,	181	Wm. H. Kingsley,	James O'Neil.
Acushnet, . . .	275	Henry F. Taber,	A. P. R. Gilmore.
Adams,	7	John Clancy,	- -
Agawam,	93	D. L. White, P. O. Feeding Hills, . . .	- -
Alford,	24	John H. Wilcox,	- -
Amesbury, . . .	228	James E. Feltham, chief fire department, . . .	A. L. Stover.
Amherst,	67	G. E. Stone, tree warden,	
Andover,	212	J. H. Playdon, tree warden,	J. H. Playdon.
Arlington, . . .	193	Walter H. Pierce, chief fire department, . . .	Wm. H. Bradley.
Ashburnham, . .	104	Arthur H. Skillings, chief fire department, . . .	Chas. A. Billings.
Ashby,	158	Wm. S. Green,	H. A. Lawrence.
Ashfield,	50	Chas. A. Hall,	- -
Ashland,	200	H. H. Piper,	Michael Geoghan.
Athol,	105	Frank P. Hall, chief fire department, . . .	Geo. E. Whitney.
Attleborough, . .	265	Hiram Packard, chief fire department, 3 Hope Street.	Wm. E. S. Smith.
Auburn,	123	J. Fred Searle,	J. Fred Searle.
Avon,	259	James W. McCarthy, Pratt Street, . . .	Willard W. Beals.
Ayer,	169	Chas. E. Perrin,	Daniel W. Mason.
Barnstable, . . .	315	Henry C. Bacon, P. O. Hyannis, . . .	Harry W. Bodfish.
Barre,	142	D. H. Rice,	George R. Simonds.
Becket,	23	Elmer D. Ballou,	- -
Bedford,	179	Chas. E. Williams,	W. A. Cutler.
Belchertown, . . .	73	James A. Peeso, constable,	Nelson Randall.
Bellingham, . . .	326	L. F. Thayer,	Henry A. Whitney.
Belmont,	194	John F. Leonard, chief fire department, . . .	Chas. H. Houlahan.
Berkley,	271	Gideon H. Babbitt,	J. M. Alexander.
Berlin,	139	Walter Cole, constable,	Ernest C. Ross.
Bernardston, . . .	39	E. E. Benjamin,	- -
Beverly,	220	Robt. H. Grant, chief fire department, . . .	Josiah B. Brown.
Billerica,	173	Geo. C. Crosby, chief engineer fire department.	Henry E. Marion.
Blackstone, . . .	114	Thomas Reilly,	A. J. Gibbons.
Blandford,	81	C. O. Shultz,	- -
Bolton,	146	Chas. E. Mace,	Chas. E. Mace.
Boston, ¹	-	- - -	D. Henry Sullivan.
Bourne,	311	Walton E. Keene,	Stillman B. Wright.

¹ No forest area.

List of Forest Wardens and Local Moth Superintendents — Con.

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Boxborough, . .	182	M. L. Wetherbee,	John J. Sherry.
Boxford, . .	218	Harry L. Cole,	Chas. Perley.
Boylston, . .	138	Chas. S. Knight, metropolitan watchman,	George A. Vickery.
Braintree, . .	244	Jas. M. Cutting, special police, P. O. South Braintree.	Oscar A. Hubbard.
Brewster, . .	318	T. B. Tubman, highway surveyor, North Brewster.	James E. Eldridge.
Bridgewater, .	293	Edwin S. Rhoades,	Walter E. Rhodes.
Brimfield, . .	99	Geo. E. Hitchcock,	- -
Brockton, . .	286	Harry L. Marston, chief fire department,	N. S. Souther.
Brookfield, . .	120	David N. Hunter,	J. H. Conant.
Brookline, . .	237	Geo. H. Johnson, chief fire department, .	Ernest B. Dane.
Buckland, . .	49	Wm. Sauer, P. O. Shelburne Falls, . .	- -
Burlington, . .	178	Walter W. Skelton, tree warden, . .	Walter W. Skelton.
Cambridge, ¹ . .	-	- - - -	J. F. Donnelly.
Canton, . .	249	Lawrence Horton, fire engineer, P. O. Ponkapoag.	Augustus Heminway.
Carlisle, . .	171	A. Lapham,	G. G. Wilkins.
Carver, . .	304	Herbert F. Atwood,	Herbert F. Atwood.
Charlemont, . .	42	Fred. D. Legate,	- -
Charlton, . .	115	Carlos Bond,	John G. Hammond.
Chatham, . .	320	Geo. W. Ryder, West Chatham, . .	Geo. B. Bassett.
Chelmsford, . .	172	Arthur E. Barton,	M. A. Bean.
Chelsea, ¹ . .	-	- - - -	J. A. O'Brien.
Cheshire, . .	11	Chas. D. Cummings,	- -
Chester, . .	80	Wm. H. Babb,	- -
Chesterfield, .	63	Chas. A. Bisbee, P. O. Bisbee, . .	- -
Chicopee, . .	87	John H. Pomphret, chief fire department,	- -
Chilmark, . .	308	Ernest C. Mayhew,	Almon S. Tilton.
Clarksburg, . .	3	Robert Lanfair, R. F. D. No. 1, North Adams.	- -
Clinton, . .	145	Wm. Clark,	Wm. McGown.
Cohasset, . .	246	Wm. J. Brennock, captain fire department.	Joseph E. Grassie.
Colrain, . .	37	Wm. H. Davenport,	- -
Concord, . .	180	G. M. Morrell, chief fire department, .	H. P. Richardson.
Conway, . .	51	Chas. Parsons, tree warden,	- -
Cummington, .	60	W. S. Gabb, P. O. Swift River, . .	- -
Dalton, . .	14	Alvah K. Cleveland, North Street, .	- -
Dana, . .	147	Thos. L. Thayer, P. O. North Dana, .	- -
Danvers, . .	345	Thomas E. Tinsley,	Thomas E. Tinsley.
Dartmouth, . .	278	Sylvanus P. Hawes,	- -

¹ No forest area.

List of Forest Wardens and Local Moth Superintendents — Con.

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Dedham, . .	241	Henry Harrigan,	George A. Phillips.
Deerfield, . .	52	Wm. L. Harris,	- -
Dennis, . .	317	Alpheus P. Baker, constable, P. O. South Dennis.	H. H. Sears.
Dighton, . .	272	Ralph Earle,	D. F. Lane.
Douglas, . .	112	W. L. Church,	Walter E. Carpenter.
Dover, . .	240	John Breagy,	Harold McKenzie.
Dracut, . .	163	Frank H. Gunther, chief fire department,	Thomas F. Carrick.
Dudley, . .	110	F. A. Putnam,	Joseph N. O'Kane.
Dunstable, . .	161	Archie W. Swallow,	James A. Davis.
Duxbury, . .	303	Fred. B. Knapp,	Henry A. Fish.
E. Bridgewater, .	298	Loren A. Flagg, chief fire department, P. O. Elmwood.	Benjamin Taylor.
East Longmeadow,	95	E. J. Speight,	- -
Eastham, . .	322	W. Horton Nickerson, road surveyor, .	N. P. Clark.
Easthampton, .	77	Frank P. Newkirk, tree warden, . .	- -
Easton, . .	264	John Baldwin, chief fire department, North Easton.	R. W. Melendy.
Edgartown, . .	309	Manuel Roberts,	Theodore S. Wimpenny.
Egremont, . .	29	Frank W. Bradford, Great Barrington, R. F. D. No. 3.	- -
Enfield, . .	74	Chas. W. Felton,	- -
Erving, . .	46	Chas. H. Holmes, P. O. Farley, . .	- -
Essex, . .	223	Otis O. Story, tree warden,	Otis O. Story.
Everett, ¹ . .	-	- - - -	James Davidson.
Fairhaven, . .	276	Albert C. Aiken,	Geo. W. King.
Fall River, . .	280	William Mulligan, tree warden, . .	Wm. Mulligan.
Falmouth, . .	312	Herbert N. Lawrence,	W. B. Bosworth.
Fitchburg, . .	157	Geo. H. Hastings,	Geo. H. Hastings.
Florida, . .	5	E. L. Jeffries, North Adams, R. F. D. No. 3.	- -
Foxborough, . .	261	Ernest A. White, chief fire department, .	Samuel J. Johnston.
Framingham, . .	197	Josiah S. Williams, P. O. Nobscot, .	N. I. Bowditch.
Franklin, . .	255	Ed. S. Cook, dealer in wood and lumber,	John N. Stobbert.
Freetown, . .	274	Andrew M. Hathaway, P. O. Assonet, .	Gilbert M. Nichols.
Gardner, . .	153	Geo. S. Hodgman,	T. W. Danforth.
Gay Head, . .	343	Leander B. Smalley, Menemsha, . .	L. B. Smalley.
Georgetown, . .	224	Clinton J. Eaton,	Clinton J. Eaton.
Gill, . .	45	Lewis C. Munn,	- -
Gloucester, . .	234	Sydney F. Haskell, Essex Avenue, .	Herbert J. Worth.
Goshen, . .	61	Sydney F. Packard, Williamsburg, R. F. D. No. 2.	- -
Gosnold, . .	344	Harold S. Veeder, P. O. Cuttyhunk, .	- -

¹ No forest area.

List of Forest Wardens and Local Moth Superintendents — Con.

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Grafton, . . .	125	Sumner F. Leonard,	Chas. K. Despeau.
Granby, . . .	79	C. N. Rust,	- -
Granville, . . .	91	Lawrence F. Henry,	- -
Great Barrington, .	25	Dan W. Flynn, 54 Russell Street, . . .	- -
Greenfield, . . .	44	Wm. A. Ames, tree warden,	Wm. A. Ames.
Greenwich, . . .	327	Wm. H. Walker, P. O. Greenwich Village, .	- -
Groton, . . .	167	Jas. B. Harrington, chief fire department, .	Joseph F. Bateman.
Groveland, . . .	225	Sydney E. Johnson, 311 Center Street, .	Raymond B. Larive.
Hadley, . . .	66	Edward P. West, tree warden,	- -
Halifax, . . .	299	Edwin H. Vaughn,	Frank D. Lyon.
Hamilton, . . .	222	Fred Berry, P. O. Essex, R. F. D., . . .	Erle G. Brewer.
Hampden, . . .	97	John S. Swenson,	- -
Hancock, . . .	9	Chas. F. Tucker,	- -
Hanover, . . .	295	Chas. E. Damon, P. O. Box 113, North Hanover, .	Lyman Russell.
Hanson, . . .	296	Albert L. Dame, tree warden, P. O. South Hanson, .	A. L. Dame.
Hardwick, . . .	141	Myron N. Ayers,	- -
Harvard, . . .	152	Benjamin J. Priest,	Geo. C. Maynard.
Harwich, . . .	319	John Condon,	John H. Drum.
Hatfield, . . .	65	John M. Strong, P. O. West Hatfield, . .	- -
Haverhill, . . .	216	John B. Gordon, chief fire department, .	Geo. F. Moore.
Hawley, . . .	48	Ernest R. Sears, tree warden, P. O. Charle- mont, .	- -
Heath, . . .	36	S. G. Benson,	- -
Hingham, . . .	289	Geo. Cushing, chief fire department, . .	Arthur W. Young.
Hinsdale, . . .	15	Lewis B. Breague, tree warden,	- -
Holbrook, . . .	247	E. W. Austin,	Wm. Haydon.
Holden, . . .	136	Henry E. Holt,	H. E. Holt.
Holland, . . .	101	O. F. Howlett, P. O. Southbridge, R. F. D. No. 2, .	- -
Holliston, . . .	202	Waldo E. Coolidge,	Geo. H. Moody.
Holyoke, . . .	85	Chas. C. Hastings,	- -
Hopedale, . . .	328	Walter F. Durgin, superintendent of parks, .	Walter F. Durgin.
Hopkinton, . . .	201	R. I. Frail,	F. F. Baldwin.
Hubbardston, . . .	149	Ernest A. Young, tree warden,	Ernest A. Young.
Hudson, . . .	199	Fred W. Trowbridge, chief fire depart- ment, .	Frederick P. Hosmer.
Hull, . . .	329	Smith F. Sturgis, tree warden, P. O. Allerton, .	John Knowles.
Huntington, . . .	70	Daniel B. Mack,	- -
Hyde Park, . . .	330	Harry G. Higbee,	Harry G. Higbee.
Ipswich, . . .	223	Augustus J. Barton,	James A. Morey.

List of Forest Wardens and Local Moth Superintendents — Con.

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Kingston, . .	301	Arthur B. Holmes,	Carl C. Faunce.
Lakeville, . .	283	Nathan F. Washburn, P. O. Middleborough.	S. T. Nelson.
Lancaster, . .	151	Everett M. Hawkins, chief fire department.	Geo. F. Morse, Jr.
Lanesborough, . .	10	King D. Keeler,	- -
Lawrence, . .	214	Chas. G. Rutter, chief fire department, .	Isaac Kelley.
Lee,	22	Jas. W. Bossidy,	- -
Leicester, . .	122	Chas. White, P. O. Cherry Valley, . .	J. H. Woodhead.
Lenox, . . .	18	Geo. W. Fitch,	- -
Leominster, . .	155	Fred A. Russell,	S. R. Walker.
Leverett, . .	57	Orman C. Marvel,	- -
Lexington, . .	188	Azor P. Howe,	E. P. Merriam.
Leyden, . . .	38	Herma W. Severance, P. O. Bernardston,	- -
Lincoln, . . .	187	Edwin R. Farrer, tree warden, . . .	Edw. R. Farrer.
Littleton, . .	170	A. E. Hopkins,	Alfred Hopkins.
Longmeadow, . .	94	Oscar C. Pomeroy,	- -
Lowell, . . .	165	Edward S. Hosmer, chief fire department,	Chas. A. Whittet.
Ludlow, . . .	88	Edward E. Chapman,	- -
Lunenburg, . .	156	Clayton E. Stone,	Myron E. Harvey.
Lynn,	331	Nathan M. Hawkes, park commissioner,	Albert C. Doak.
Lynnfield, . .	209	Thos. E. Cox, P. O. Wakefield, R. F. D.,	Alfred W. Copeland.
Malden, . . .	191	Frank Turner, chief fire department, .	George W. Stiles.
Manchester, . .	236	Frederick Burnham,	John D. Morrison.
Mansfield, . .	263	Herbert E. King,	W. O. Sweet.
Marblehead, . .	332	Wm. H. Stevens,	Wm. H. Stevens, 2d.
Marion, . . .	306	Geo. B. Nye,	James H. Morss.
Marlborough, . .	198	Chas. H. Andrews, chief fire department,	Timothy J. Brennan.
Marshfield, . .	292	Edward E. Ames,	P. R. Livermore.
Mashpee, . . .	313	Joseph A. Peters,	Watson F. Hammond.
Mattapoissett, . .	281	Everett C. Stetson,	Geo. E. Barrows.
Maynard, . . .	184	Arthur J. Coughlan, Maynard's block, .	Albert Coughlan.
Medfield, . . .	252	Waldo E. Kingsbury, chief fire department.	Geo. L. L. Allen.
Medford, . . .	192	Chas. Bacon, chief fire department, . .	Wm. J. Gannon.
Medway, . . .	254	Clyde C. Hunt, captain fire department,	Frank Hager.
Melrose, . . .	-	- - -	John J. McCullough.
Mendon, . . .	119	Geo. B. Cromb,	Frank M. Aldrich.
Merrimac, . . .	227	Edgar P. Sargent,	Chas. R. Ford.
Methuen, . . .	213	Herbert B. Nichols,	Alfred H. Wagland.

List of Forest Wardens and Local Moth Superintendents — Con.

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Middleborough, . .	284	C. W. Weston,	- -
Middlefield, . . .	342	Thos. H. Fleming, P. O. Bancroft, . .	- -
Middleton, . . .	211	Oscar H. Sheldon,	B. T. McGlaulin.
Milford, . . .	127	Elbert M. Crockett, chief fire department.	Patrick F. Fitzgerald.
Millbury, . . .	124	Wm. E. Horn,	Edw. F. Roach.
Millis, . . .	253	Chas. La Croix,	Fred Holland.
Milton, . . .	242	Nathaniel T. Kidder, park commissioner,	Nathaniel T. Kidder.
Monroe, . . .	34	S. R. Tower,	- -
Monson, . . .	98	Omer E. Bradway,	- -
Montague, . . .	53	Fred W. Lyman, lumber dealer, . .	- -
Monterey, . . .	28	J. H. Bills,	- -
Montgomery, . .	82	Frank C. Preston, P. O. Huntington, .	- -
Mt. Washington, .	30	Ira L. Patterson,	- -
Nantucket, . . .	333	Albert R. Coffin,	Geo. M. Winslow.
Nahant, . . .	-	Thos. Roland,	Thomas Roland.
Natick, . . .	204	Wm. E. Daniels,	H. H. Hunnewell.
Needham, . . .	238	Howard H. Upham, chief fire department.	Ernest E. Riley.
New Ashford, . .	6	Wm. E. Baker,	- -
New Bedford, . .	277	Edward F. Dahill, chief fire department,	Chas. F. Lawton.
New Braintree, . .	131	E. L. Havens,	- -
New Marlborough,	32	Jas. McLaughlin, P. O. Mill River, . .	- -
New Salem, . . .	55	Rawson King, P. O. Cooleyville, . .	- -
Newbury, . . .	231	Wm. P. Bailey,	O. B. Tarbox.
Newburyport, . .	230	Chas. P. Kelley,	Chas. P. Kelley.
Newton, . . .	205	Walter B. Randlett, chief fire department, P. O. West Newton.	Chas. I. Bucknam.
Norfolk, . . .	256	Andrew R. Jones,	C. Albert Murphy.
North Adams, . .	4	H. J. Montgomery, chief fire department,	- -
North Andover, . .	215	Geo. A. Rea,	Peter Holt.
N. Attleborough, .	262	Harvey W. Tufts, chief fire department,.	F. P. Toner.
North Brookfield, .	129	Harold A. Foster,	Samuel D. Colburn.
North Reading, . .	175	Irving F. Batchelder,	Geo. E. Eaton.
Northampton, . .	72	Frederick E. Chase,	- -
Northborough, . .	140	T. P. Haskell,	T. P. Haskell.
Northbridge, . .	117	W. E. Burnap, P. O. Whitinsville, . .	Arthur F. Whitin.
Northfield, . . .	40	Fred. W. Doane,	- -
Norton, . . .	266	Alden G. Walker,	Owen G. Walker.
Norwell, . . .	290	John Whalen,	John H. Sparrell.

List of Forest Wardens and Local Moth Superintendents — Con.

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Norwood, . . .	250	J. Fred Boyden, chief fire department, .	H. Frank Winslow.
Oak Bluffs, . . .	334	Frank W. Chase,	Patrick P. Hurley.
Oakham, . . .	135	Chas. H. Trowbridge,	Chas. H. Trowbridge.
Orange, . . .	47	Frank M. Jennison,	F. M. Jennison.
Orleans, . . .	321	Chas. F. Poor,	Albert A. Smith.
Otis, . . .	27	Chester R. Cromwell,	- -
Oxford, . . .	335	T. M. Harrington,	Chas. G. Larned.
Palmer, . . .	89	James Summers, chief fire department, P. O. Box 333.	C. H. Keith.
Paxton, . . .	130	Fred A. Durgin,	Louis M. Robinson.
Peabody, . . .	219	Michael V. McCarthy, Forest Street, .	James F. Callahan.
Pelham, . . .	68	E. A. Harris, P. O. Amherst,	- -
Pembroke, . . .	294	Jos. J. Shepherd,	Calvin S. West.
Pepperell, . . .	160	Geo. G. Tarbell, P. O. East Pepperell, .	John Tune.
Peru, . . .	16	John Frizell,	- -
Petersham, . . .	148	Geo. P. Marsh,	Frank A. Hathaway.
Phillipston, . . .	106	Wm. Cowlbeck, P. O. Athol, R. F. D. No. 3.	Wm. H. L. Coulbeck.
Pittsfield, . . .	13	Lucien D. Hazard,	- -
Plainville, . . .	59	Edward C. Barney,	Chas. N. Snell.
Plainfield, . . .	309	Lestan E. Parker,	- -
Plymouth, . . .	302	Herbert Morissey,	Abbott A. Raymond.
Plympton, . . .	300	Thomas W. Blanchard,	David Bricknell.
Prescott, . . .	69	Waldo H. Pierce, P. O. Greenwich Village,	- -
Princeton, . . .	150	W. A. Williams,	Frank A. Skinner.
Provincetown, . . .	325	James H. Barnett,	John M. Burch.
Quincy, . . .	243	Peter J. Williams, chief fire department,	Andrew J. Stewart.
Randolph, . . .	248	Chas. A. Wales, chief fire department, .	James E. Blanche.
Raynham, . . .	270	John V. Festing, chief fire department, .	Geo. M. Leach.
Reading, . . .	176	Herbert E. McIntire,	Henry M. Donegan.
Rehoboth, . . .	268	Silas A. Pierce,	Stephen W. Robinson.
Revere, ¹ . . .	-	- - -	Geo. P. Babson.
Richmond, . . .	17	T. B. Salmon,	- -
Rochester, . . .	282	Wm. N. Smellie,	Chester B. Morse.
Rockland, . . .	288	John H. Burke, clerk fire board, . . .	Frank H. Shaw.
Rockport, . . .	235	A. J. McFarland, P. O. Box 91, . . .	Frank A. Babcock.
Rowe, . . .	35	Merritt A. Peck,	- -
Rowley, . . .	232	Daniel O'Brien,	Daniel O'Brien.
Royalston, . . .	102	Willard W. White, P. O. South Royalston,	W. W. White.

¹ No forest area.

List of Forest Wardens and Local Moth Superintendents — Con.

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Russell, . . .	83	Sidney F. Shurtleff, highway surveyor, .	- -
Rutland, . . .	143	Henry Converse, chief fire department, .	H. Edw. Wheeler.
Salem, ¹ . . .	-	- - - -	Amos Stillman.
Salisbury, . . .	229	Wm. H. Evans,	Henry C. Rich.
Sandisfield, . . .	33	Lyman H. Clark, P. O. New Boston, .	- -
Sandwich, . . .	314	John F. Carleton, P. O. Spring Hill, .	B. F. Denison.
Saugus, . . .	207	Ole C. Christiansen,	Thos. E. Berrett.
Savoy, . . .	8	Herbert H. Fitzroy, P. O. Savoy Center,	- -
Scituate, . . .	291	Ernest R. Seaverns, chief fire department.	Percival S. Brown.
Seekonk, . . .	267	John L. Barker, P. O. Attleborough, R. F. D. No. 4.	Harold F. Thompson.
Sharon, . . .	251	A. A. Carpenter,	T. J. Leary.
Sheffield, . . .	31	Arthur H. Tuttle,	- -
Shelburne, . . .	43	H. O. Fiske, P. O. Shelburne Falls, .	- -
Sherborn, . . .	203	Milo F. Campbell, South Sherborn, .	J. P. Dowse.
Shirley, . . .	168	Melvin W. Longley, P. O. Shirley Centre,	A. A. Adams.
Shrewsbury, . . .	132	Wm. E. Rice,	Frank L. Ott.
Shutesbury, . . .	58	Minor A. Haskell,	- -
Somerset, . . .	336	Wm. F. Griffiths, Swansea, R. F. D., .	Chas. Riley.
Somerville, ¹ . . .	-	- - - -	Asa B. Pritchard.
South Hadley, . . .	78	Joseph Beach, P. O. South Hadley Falls,	- -
Southampton, . . .	76	Geo. W. Tyler,	- -
Southborough, . . .	337	Harry Burnett, tree warden,	Harry Burnett.
Southbridge, . . .	109	Aimee Langevin, Olney Avenue, . . .	Joseph Proulx.
Southwick, . . .	92	Lowell A. Mason,	- -
Spencer, . . .	121	A. F. Howlett, chief fire department, .	Geo. H. Ramer.
Springfield, . . .	86	Burton Steere, assistant fire chief, .	Wm. F. Gale.
Sterling, . . .	144	G. F. Herbert,	Jos. H. Kilbourn.
Stockbridge, . . .	21	Geo. Schneyer, P. O. Glendale, . . .	- -
Stoneham, . . .	190	Geo. E. Sturtevant, chief fire department,	Geo. M. Jefts.
Stoughton, . . .	258	Jesse E. Smith,	Wm. P. Kennedy.
Stow, . . .	183	Wm. H. Parker, P. O. Gleasondale, .	Geo. A. Patterson.
Sturbridge, . . .	108	Chas. M. Clark, P. O. Fiskdale, . . .	- -
Sudbury, . . .	185	F. E. Bent,	Wm. E. Baldwin.
Sunderland, . . .	338	A. C. Warner,	- -
Sutton, . . .	116	R. W. Richardson,	John E. Gifford.
Swampscott, . . .	339	Geo. P. Cahoon, chief fire department, .	Everett P. Mudge.
Swansea, . . .	273	Thos. L. Mason, R. F. D. No. 2, . . .	E. C. Gardner.

¹ No forest area.

List of Forest Wardens and Local Moth Superintendents — Con.

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Taunton, . . .	269	Fred. A. Leonard, chief fire department, .	Alvaro Harnden.
Templeton, . . .	107	Henry H. Seaver, P. O. Baldwinville, .	John B. Wheeler.
Tewksbury, . . .	364	Herbert W. Pillsbury,	Harris M. Briggs.
Tisbury, . . .	310	Elmer C. Chadwick,	Presbury S. Luce.
Tolland, . . .	90	Eugene M. Moore,	- -
Topsfield, . . .	218	Geo. F. Averill,	C. W. Floyd.
Townsend, . . .	159	F. J. Piper, chief fire department, .	Geo. E. King.
Truro, . . .	324	Naylor Hatch,	Joseph H. Atwood.
Tyngsborough, . .	162	Otis L. Wright,	Howard E. Noble.
Tyringham, . . .	26	Geo. F. Knapp,	- -
Upton, . . .	126	E. M. Baker, chief fire department, .	Geo. H. Evans.
Uxbridge, . . .	113	Louis F. Rawson,	H. T. Newell.
Wakefield, . . .	208	Samuel T. Parker,	W. W. Whittredge.
Wales, . . .	100	W. W. Eager,	- -
Walpole, . . .	340	Horace A. Spear, Jr.,	Philip R. Allen.
Waltham, . . .	195	Geo. L. Johnson, chief fire department, .	Warren M. Ryan.
Ware, . . .	75	L. S. Charbonneau, P. O. Box 25, .	Fred E. Zeissig.
Wareham, . . .	305	A. C. Keyes,	J. J. Walsh.
Warren, . . .	119	Joseph St. George,	Alfred A. Warriner.
Warwick, . . .	41	Chas. A. Williams,	- -
Washington, . . .	19	Geo. Messenger, R. F. D., Becket, .	- -
Watertown, . . .	206	John C. Ford, tree warden,	John C. Ford.
Wayland, . . .	196	Clarence S. Williams, Cochituate, .	Daniel Graham.
Webster, . . .	111	Arthur G. Pattison,	Carl Klebart.
Wellesley, . . .	239	Fletcher M. Abbott, tree warden, .	Fletcher M. Abbott.
Wellfleet, . . .	323	Edwin P. Cook,	Everett S. Jacobs.
Wendell, . . .	54	Geo. A. Lewis,	- -
Wenham, . . .	221	Jacob D. Barnes, tree warden, . . .	Jacob D. Barnes.
West Boylston, . .	137	Frank H. Baldwin, agent Metropolitan Water Board.	Chas. H. Baldwin.
West Bridgewater, .	285	Warren P. Laughton,	Octave Belmore.
West Brookfield, .	128	J. H. Webb,	- -
West Newbury, . .	226	Silas M. Titcomb, P. O. Byfield, .	Robert J. Forsythe.
West Springfield, .	341	A. A. Sibley,	- -
West Stockbridge, .	20	Bernard Manning,	- -
West Tisbury, . .	307	Wm. J. Rotch,	John Pease.
Westborough, . .	133	James H. McDonald, chief fire department.	Walter Sullivan.
Westfield, . . .	84	Geo. H. Byers, chief fire department, Arnold Street.	- -

List of Forest Wardens and Local Moth Superintendents — Con.

TOWN OR CITY.	Badge No.	Forest Warden.	Local Moth Superintendent.
Westford, . . .	166	John A. Healey, P. O. Graniteville, . .	Harry L. Nesmith.
Westhampton, . .	71	Levi Burt,	- -
Westminster, . .	154	John C. Goodridge, chief fire department.	Stillman Whitney.
Weston, . . .	186	Edward P. Ripley,	Edw. P. Ripley.
Westport, . . .	279	Herbert A. Sanford,	Jonathan B. Hicks.
Westwood, . . .	251	Percy R. Dean,	C. H. Southerland.
Weymouth, . . .	245	J. R. Walsh, East Weymouth, . . .	Chas. L. Merritt.
Whately, . . .	56	James A. Wood,	- -
Whitman, . . .	297	Clarence A. Randall, tree warden, . .	Clarence A. Randall.
Wilbraham, . . .	96	Henry I. Edson, P. O. North Wilbraham,	- -
Williamsburg, . .	64	Howard C. Pomeroy,	- -
Williamstown, . .	2	Daniel Hogan,	- -
Wilmington, . . .	174	Joseph M. Hill, chief fire department, North Wilmington.	Oliver McGrane.
Winchendon, . . .	103	Arthur L. Brown, chief fire department, .	John G. Folsom.
Winchester, . . .	189	Irving L. Symmes, chief fire department,	Samuel S. Symmes.
Windsor, . . .	12	H. W. Ford,	- -
Winthrop, ¹ . . .	-	- - -	Frank W. Tucker.
Woburn, . . .	177	Frank E. Tracy, chief fire department, .	James H. Kelley.
Worcester, . . .	131	Arthur V. Parker,	Harold J. Neale.
Worthington, . . .	62	Howard C. Brewster,	- -
Wrentham, . . .	260	E. S. Stone, captain fire department, .	Wm. M. Gilmore.
Yarmouth, . . .	316	Seth Taylor,	Chas. R. Bassett.

¹ No forest area.

NEW LEGISLATION.

The following new legislation, relative to forestry matters, was enacted by the last General Court.

As the liberation of fire balloons during seasons of drought has been the cause of several extremely damaging forest fires during the past few years, and as their continued use would be a constant menace to property in the future, it seemed imperative that legislation should be enacted which would eliminate this danger. The following law was therefore passed: —



A view of the State Forester's exhibit on the better farming electric train.

ACTS OF 1910, CHAPTER 141.

AN ACT TO PROHIBIT THE USE OF FIRE BALLOONS.

Be it enacted, etc., as follows:

It shall be unlawful within any city or town in this commonwealth for any person to liberate or fly fire balloons of any description. Whoever violates this act shall be punished by a fine of not more than one hundred dollars, or by imprisonment for not more than one month, or by both such fine and imprisonment. [*Approved March 2, 1910.*]

The enactment of the following law will undoubtedly result in lessening the number and size of forest fires, by stimulating a desire on the part of many towns to adopt reasonable preventive measures, and to provide proper apparatus to extinguish fires when they do occur. This law is dealt with more in detail in the chapter devoted to forest fires.

ACTS OF 1910, CHAPTER 398.

AN ACT RELATIVE TO PROTECTION AGAINST FOREST FIRES.

Be it enacted, etc., as follows:

SECTION 1. Every town in the commonwealth with a valuation of one million five hundred thousand dollars or less which appropriates and expends money, with the approval of the state forester, for apparatus to be used in preventing or extinguishing forest fires or for making protective belts or zones as a defence against forest fires, shall be entitled, upon the recommendation of the state forester, approved by the governor, to receive from the treasury of the commonwealth a sum equal to one half of the said expenditure, but no town shall receive more than two hundred and fifty dollars.

SECTION 2. A sum not exceeding five thousand dollars in any one year may be expended in carrying out the provisions of this act.

SECTION 3. This act shall take effect upon its passage. [*Approved April 13, 1910.*]

So numerous have been forest fires in Barnstable and Plymouth counties within the past few years, the cause of which in many cases has been attributed to the carelessness and indifference of berry pickers and camping parties, that many prominent citizens of those counties petitioned for legislation which, if properly enforced, would serve to lessen the danger of fire from the above-named source. The following law was therefore enacted: —

ACTS OF 1910, CHAPTER 478.

AN ACT RELATIVE TO THE PICKING OF BERRIES AND FLOWERS AND TO CAMPING AND PICNICKING DURING CERTAIN MONTHS IN THE COUNTIES OF BARNSTABLE AND PLYMOUTH.

Be it enacted, etc., as follows:

SECTION 1. It shall be unlawful for any unnaturalized, foreign-born person to pick wild berries or flowers, or to camp or picnic, upon any land of which he is not the owner, within the counties of Barnstable and Plymouth, between the first day of April and the first day of December, without first obtaining written permission so to do from the owner or owners of the land. The said written permit shall not be transferable, and shall be exhibited upon demand to the forest warden, or his deputies, of the town wherein the land is located, or upon demand of any sheriff, constable, police officer or other officer authorized to arrest for crime. Failure or refusal to produce said permit upon such demand shall be prima facie evidence of a violation of this act, and any forest warden or any duly authorized deputy forest warden, police officer, sheriff or other officer authorized to arrest for crime, may arrest without warrant any person who fails or refuses to display for inspection the said permit upon the demand of any of the officials named in this act.

SECTION 2. Whoever violates any provision of this act shall be punished by a fine of not more than fifty dollars, or by imprisonment for not more than thirty days, or by both such fine and imprisonment.
[Approved May 3, 1910.]

In response to the suggestion made by Governor Draper in his inaugural address, as well as the recommendation contained in the annual report of the State Forester, the law relative to the suppression of the gypsy and brown-tail moths was so amended as to make the office of local moth superintendent appointive rather than elective, and the appointees subject to the approval of the State Forester. The object of this legislation was to insure the appointment of thoroughly competent men to have charge of this important work in the cities and towns of the Commonwealth. The amendment was as follows:—

ACTS OF 1910, CHAPTER 150.

AN ACT RELATIVE TO THE APPOINTMENT OF LOCAL SUPERINTENDENTS
FOR THE SUPPRESSION OF THE GYPSY AND BROWN TAIL MOTHS.

Be it enacted, etc., as follows:

SECTION 1. Section four of chapter three hundred and eighty-one of the acts of the year nineteen hundred and five, as amended by section two of chapter two hundred and sixty-eight of the acts of the year nineteen hundred and six, and by section one of chapter five hundred and twenty-one of the acts of the year nineteen hundred and seven, is hereby further amended by striking out at the beginning thereof, the words "Cities and towns by such public officer or board as they shall designate or appoint, shall under the advice and general direction of said superintendent", and inserting in place thereof the words:—The mayor and aldermen in cities and the selectmen in towns shall annually in the month of March or April appoint a local superintendent for the suppression of gypsy and brown tail moths. Said superintendent shall, under the advice and general direction of the state forester, — also by inserting after the word "herein", in the eighth line, the words:—The appointment of a local superintendent shall not take effect unless approved by the state forester, and when so approved, notice of the appointment shall be given by the mayor and aldermen or the selectmen to the person so appointed, — so that the first paragraph of said section as amended will read as follows:—*Section 4.* The mayor and aldermen in cities and the selectmen in towns shall annually in the month of March or April appoint a local superintendent for the suppression of gypsy and brown tail moths. Said superintendents shall, under the advice and general direction of the state forester, destroy the eggs, caterpillars, pupae and nests of the gypsy and brown tail moths within their limits, except in parks and other property under the control of the commonwealth, and except in private property, save as otherwise provided herein. The appointment of a local superintendent shall not take effect unless approved by the state forester, and when so approved, notice of the appointment shall be given by the mayor and aldermen or the selectmen to the person so appointed. When any city or town shall have expended within its limits city or town funds to an amount in excess of five thousand dollars in any one fiscal year, in suppressing gypsy or brown tail moths, the commonwealth shall reimburse such city or town to the extent of fifty per cent of such excess above said five thousand dollars.

SECTION 2. This act shall take effect upon its passage. [*Approved March 2, 1910.*]

In order to legalize the acceptance by the State Forester, on behalf of the Commonwealth, of bequests or gifts made for the

purpose of promoting forestry in Massachusetts, the following law was enacted:—

ACTS OF 1910, CHAPTER 153.

AN ACT TO AUTHORIZE THE STATE FORESTER TO ACCEPT BEQUESTS OR GIFTS ON BEHALF OF THE COMMONWEALTH.

Be it enacted, etc., as follows:

SECTION 1. The state forester, with the approval of the governor and council, is hereby authorized to accept, on behalf of the commonwealth, bequests or gifts to be used for the purpose of advancing the forestry interests of the commonwealth, under the direction of the governor and council, in such manner as to carry out the terms of the bequest or gift.

SECTION 2. This act shall take effect upon its passage. [*Approved March 3, 1910.*]

An act was passed to provide funds for carrying on the gypsy and brown-tail moth work, and for experimenting with parasites for destroying said moths, as follows:—

ACTS OF 1910, CHAPTER 234.

AN ACT MAKING APPROPRIATIONS FOR THE SUPPRESSION OF THE GYPSY AND BROWN TAIL MOTHS.

Be it enacted, etc., as follows:

SECTION 1. The sums hereinafter mentioned are appropriated, to be paid out of the treasury of the commonwealth from the ordinary revenue, for the purposes specified, to wit:—

For the suppression of the gypsy and brown tail moths in the year nineteen hundred and ten, and for expenses incidental thereto, a sum not exceeding one hundred and fifty thousand dollars, the same to be in addition to any amount heretofore appropriated for this purpose.

For experimenting with parasites or natural enemies for destroying said moths, and for expenses incident thereto, a sum not exceeding fifteen thousand dollars, in addition to any unexpended balance of a former appropriation for this purpose.

SECTION 2. This act shall take effect upon its passage. [*Approved March 18, 1910.*]

ACKNOWLEDGMENTS.

It gives the State Forester great pleasure to acknowledge the continued valuable services and loyal support which he has received through his assistants and workers in this department, whether it be in the office or field work, throughout the year.

The work on the part of all has been enthusiastically and willingly undertaken. All of the members of the staff are entitled to the greatest possible credit for their efficient services.

He also desires to express his great appreciation of the generous treatment and kindly assistance rendered him by all citizens, boards and officials with whom he has come in contact, and again to emphasize the kindly co-operation on the part of the United States government through Dr. L. O. Howard of the Bureau of Entomology and Mr. D. M. Rogers, field agent; also of Harvard University, through Dean W. C. Sabine and the departments represented on the co-operative scientific staff.

STEAM RAILROAD "FARMING SPECIAL" TRAIN.

The needs of better farming methods and a much greater production from farming lands are receiving much attention all over this country. Here in our own State this feeling has been materially augmented during the past year through the earnest endeavors of the State Forester, the State Board of Agriculture and the Massachusetts Agricultural College, aided by the Boston & Albany Railroad, to exploit the opportunities that exist for land owners of the Old Bay State. In line with this movement, the Boston & Albany Railroad ran a "Better Farming Special" over its road March 30 and 31 and April 1 and 2, consisting of five observation cars, fully equipped with exhibits representing every branch of agriculture and forestry.

The "Better Farming Special" visited the following cities and towns: —

Wednesday, March 30. — Westfield; Pittsfield; Cheshire; North Adams.

Thursday, March 31. — Chester; Springfield; Enfield; New Salem; Athol.

Friday, April 1. — Templeton; Barre Plains; Ware; Palmer; East Brookfield.

Saturday, April 2. — Worcester; Westborough; South Framingham; Milford.

At each place the special was met by hundreds of farmers, who in many instances had driven miles to enjoy the privilege of

listening to the lectures on the many themes relating to farming, as given by the representatives of the Massachusetts Agricultural College and the State Board of Agriculture; also, the development of forestry and the work of suppressing the gypsy and brown-tail moths, as presented by the State Forester and his assistants. At some of the stations were gathered whole schools, in charge of their teachers, and great interest was shown by them in both the lectures and the exhibits.

One entire car was devoted to forestry, under the direction of the State Forester, and included in the exhibits were the following: —

Pine seedlings, varying in age from one to three years.

Photographs showing modern and approved methods of forestry management and reforestation work.

Photographs showing fires, and damage done by same.

Complete equipment for forest-fire fighting.

Living gypsy moth caterpillars.

Living brown-tail moth caterpillars.

Mounted specimens showing the life history of the gypsy and brown-tail moths.

A large collection of parasites, such as have been imported from abroad.

Living *Calosoma* beetles.

Several species of native predaceous beetles of the gypsy moth.

Photographs showing different methods used in moth-suppression work.

Photographs of apparatus used in moth-suppression work.

Trees showing the proper method of treating cavities by tin patching.

Oak tree, showing brown-tail moth webs in their winter stage.

Living egg parasites.

Specimens of many other insects of economic importance.

The forest-fire wagon, designed and equipped under the direction of the State Forester, attracted much attention and received favorable comment from scores of town officials, who manifested a great deal of interest in the forest-fire problem. Another feature of the State Forester's exhibit which created widespread interest was the living specimens of the gypsy and brown-tail moth caterpillars, which gave to hundreds of people their first opportunity to see these dangerous insect pests.

Evening meetings were held at North Adams, Athol and

Worcester, and large and enthusiastic audiences were addressed by leading men on agricultural and allied topics.

The enterprise from start to finish was declared a pronounced success, and without doubt proved to be a valuable factor in stimulating and advancing the farming and forestry interests of Massachusetts.

ELECTRIC RAILROAD "FARMING SPECIAL" TRAIN.

So marked was the value of the exhibition to the farming interests of the territory traversed by the Boston & Albany special that the officials of the New England Investment and Security Company, which controls between nine hundred and one thousand miles of trolley lines in western Massachusetts, immediately tendered the Agricultural College and State department, without expense, every facility and convenience which they had to offer in running a trolley special over their lines in sections of the State not covered by the former trip.

In accordance with this plan, on April 14 four cars, equipped in practically the same manner as those of the Boston & Albany special, left Amherst on a three-days tour of education. The itinerary was as follows: —

Thursday, April 14. — South Hadley; Russell; Huntington; Springfield.

Friday, April 15. — North Wilbraham; Brimfield; Sturbridge; Charlton Center.

Saturday, April 16. — Oxford; Holden; Sterling; Worcester.

Much enthusiasm and interest greeted the special at every stop. At South Hadley nearly three hundred students of Mt. Holyoke College attended the demonstrations and enjoyed the lectures.

A splendid agricultural rally was held at Springfield on the evening of the 14th, under the auspices of the Springfield Board of Trade, where over five hundred business men listened to an address by President Butterfield of the Massachusetts Agricultural College, in which he impressed upon them the importance of co-operation in advancing the interests of commercial farming in our State.

This was undoubtedly the first trolley "farming special" ever attempted in this country, and its success proves that a grand service can by this means be rendered agricultural education in the future.

PUBLICATIONS OF THE STATE FORESTER.

It has been the aim of the office to publish as rapidly as possible such information as our people desire regarding forestry in its various phases. As requests came in, the department has anticipated the requirements, and has written bulletins which give in a practical and workable way detailed information, so that our people will not lack for guidance in actually accomplishing something, if they are so inclined.

At present we have a list of bulletins which cover fairly well the general information most likely to be required. By being able to furnish a bulletin which goes more into detail than is possible in a letter, the State Forester can do himself great justice.

We do not attempt sending out the whole list of bulletins unless specially requested to do so, or unless we feel sure that they are likely to be appreciated and used. The department has a mailing list of about 3,000 names of those who have shown some special interest in forestry. The mailing list is revised occasionally by writing and asking if the bulletins are still desired.

Two publications issued by the State Forester were so eagerly sought after that the Legislature believed it advisable that they be sold at cost; hence they are the only exceptions in the list. These are especially valuable in the identification of trees and in school work. The list of publications of the department follows: —

- *1. Forest Trees of Massachusetts: how you may know them. A Pocket Manual.
- *2. The Study of Trees in our Primary Schools.
- 3. Massachusetts Wood-using Industries.
- 4. The Evergreens. Methods of Study in Public Schools.
- 5. Re-forestation in Massachusetts.
- 6. How and when to collect White Pine Seed.
- 7. Forest mensuration of the White Pine. How to estimate Standing Timber.

8. How to make Improvement Thinnings.
9. We must stop Forest Fires in Massachusetts.
10. Forest fire-fighting Equipment in our Towns.
11. The Gypsy and Brown-tail Moths.
12. The Annual Report of the State Forester.
13. Laws relating to Forestry, and the Suppression of the Gypsy and Brown-tail Moths.
14. Colored Plates of the Gypsy and Brown-tail Moths and Calosoma Beetle.
15. Suggestions in Regard to Municipal Forests: a Practical Example.

[NOTE. — Under the resolves authorizing their publication, the two bulletins marked * must be sold by the State Forester at a price not less than their cost. Thus, the price of "Forest Trees of Massachusetts: how you may know them," is 5 cents a copy at the office, 6 Beacon Street, Boston, or 2 cents extra by mail; and of "The Study of Trees in our Primary Schools," 12 cents a copy, or 8 cents extra by mail. Any other bulletins in the list may be obtained at the office, or will be mailed upon request without cost.]

PART I.

GENERAL FORESTRY.

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EXAMINATIONS OF WOODLAND.

The examination of private woodland for owners requesting such examination, one of the oldest branches of our work, has been carried on as in former years, and the even distribution over the whole year of the applications for such examinations, without extra solicitation on the part of this office, seems to indicate a steady and healthy interest on the part of the owners of this class of land. The work, as was explained last year, consists usually of a visit to the land in company with the owner or some other interested person, advice as to treatment given verbally on the ground, and often a subsequent written report.

This year an attempt has been made to keep in closer touch with examinees and the manner in which the recommendations of the office are carried out, by making a personal inspection, usually at a time when in the locality on other business. In this way owners were made to feel that an interest was being taken in their work, and in every case the office has felt well repaid by the results.

It has not been possible to make such inspections in large numbers, partly because the work was not begun till well along in the year, and partly because only those owners are visited where it is felt that enough time has elapsed to make the visit profitable. Enough has been done, however, to prove the advantages of the plan, and it is intended to push the work steadily during the coming season.

The following table gives a list of the examinations made, their location and area. A table of costs will be found at the end of this section of the report.

OWNER.	Town.	Area (Acres).
Allen, P. R.,	Walpole,	5
Bent, F. E.,	Sudbury,	30
Borden, N. E.,	South Framingham,	60
Boston & Northern Street Railway,	Groveland,	38
Brayton, A. P.,	Somerset,	13
Brochu, J. E.,	Attleborough,	100
Burnett, H., trustee,	Hopkinton,	116
Chandler, J. F.,	Tyngsborough,	10
Creamer, F.,	Peru,	40
Cummings, W. O.,	Tyngsborough,	10
Cushing, J. S.,	Norwood,	2½
Dewar, D. W.,	Carlisle,	40
Eddy, Mary B.,	Newton,	10
Emerson, Dr. A. W.,	Norwood,	100
Fitchburg Water Board,	Westminster and Fitchburg,	400
Forrest, W. P.,	Foxborough,	22
Fowle, D. H.,	Newbury,	30
Fuller, W. A.,	Clinton,	49
Fuller, W. A.,	Harvard,	107
Fuller, W. A.,	Bolton,	128
Gerrish, Isabel F.,	Ashland,	47
Green, F. C.,	Bourne and Plymouth,	400
Harriman, C. S.,	North Wilmington,	4
Holmes, E. B.,	Abington,	30
Horne, W. N.,	Foxborough,	32
Hunnewell, H. H.,	Natick,	250
Jones, J. L.,	Halifax,	1,400
Lawrence, I. P.,	Ashburnham,	200
Mahoney, T. J.,	Wareham,	¼
Main, F. H.,	Lanesborough,	200
Manning, W.,	Marion,	400
Massachusetts Agricultural College, branch farm,	Sandwich,	20
Minns, Susan,	Princeton,	127
Minot, W.,	Wareham,	50
Morey, E.,	Ashland,	20
Nelson, H. W.,	Marshfield,	45
Pickman, D. L.,	Bedford,	400
Robinson, C. E.,	Hinsdale,	800
Sawyer, A. H.,	Salisbury,	30
Sears, Julia M.,	Tyngsborough,	30

OWNER.	Town.	Area (Acres).
Seavey, H.,	Canton,	125
Simmons, H. F.,	Hanover,	10
Stevens, E. A.,	Duxbury,	40
Stevens, H. H.,	Marlborough,	30
Tenney, C. H.,	Methuen,	75
Tracy, Harriet E.,	Peru,	175
Webber, F. S.,	South Hadley,	10
White, J. H.,	Bridgewater,	25
Willets, H.,	New Marlborough,	200
Total, . . . . .	. . . . .	6,495

In all, 17 inspections have been made, with an aggregate area of 1,080 acres:—

OWNER.	Town.	Area (Acres).
Bird, C. S.,	Walpole,	60
Bridgman, H. A.,	Shirley,	15
Burbank Hospital,	Fitchburg,	400
Burgess, J. K.,	Dedham,	50
Codman, Catherine,	Dedham,	18
Emery, Miss M. E.,	West Newbury,	55
Fisher, Lewis N.,	Walpole,	7
Fiske, Warren,	Harvard,	200
Holmes, E. B.,	Abington,	30
Hutchins, C. L.,	Concord,	25
Joslin, E. P.,	Oxford,	100
Needham Water Board,	Needham,	5
Plympton, Mrs. A. L.,	Dover,	10
Prescott, C. W.,	Concord,	60
Stevens, Chas.,	Sudbury,	5
Thorndike, R. K.,	Millis,	20
Walpole High School,	Walpole,	20

WOODLAND 'MANAGEMENT.

The forestry department wishes to lay especial emphasis on another recent development of its work; namely, management of private woodlands by the owner, under the continuous super-

vision of this office. Under this plan, several private owners are this winter carrying on regular thinning improvement cutting, fire-line making and other forestry operations, under the more or less regular instruction and general supervision of a forestry assistant.

In one instance, that of the Burbank Hospital, treated more fully elsewhere, a regular lumbering operation was completed.

In any case the plan is doubly advantageous, both to the owner and the office, in that it is made possible for such owners to employ the same men used by the reforestation department in its spring planting, thus getting the profit of experienced labor at the same price that would have to be paid for inferior workmen; while at the same time the office is pleased to offer its men continuous employment, instead of losing all trace of them immediately at the close of the planting season. The owner, of course, pays all cost of the work, including travelling expenses of the expert from this office, the assistance only being given free.

In addition to the advantages already indicated, there is the far-reaching one of having within the State an ever-increasing number of men, and more particularly of competent bosses, who understand not only woods work but woods work along practical forestry lines; this body of men to act as a nucleus around which to build up an effective force for carrying out the many and increasingly difficult forestry problems which are pressing for immediate solution.

Owners and towns where the work described above either is or soon will be under way are as follows:—

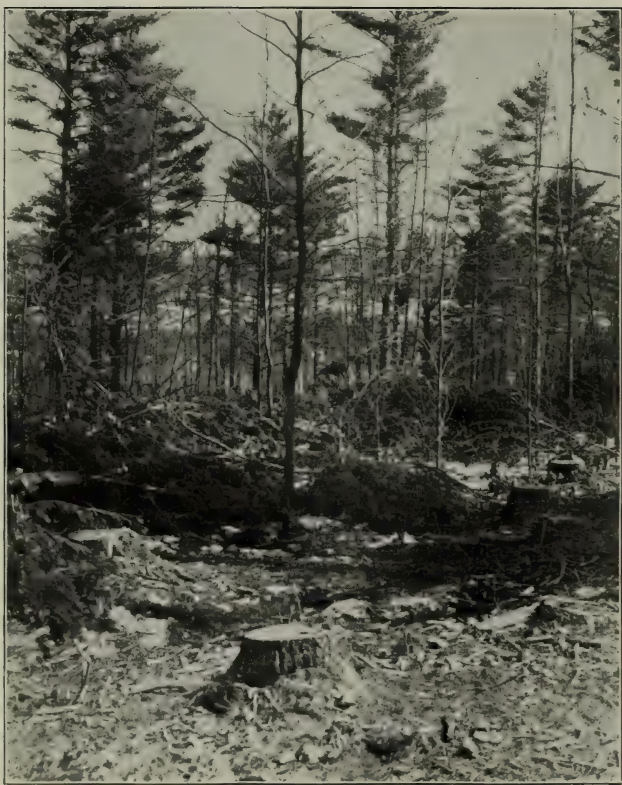
R. B. Symmington, Plymouth, has thinned about 50 acres.

Francis C. Green, Buzzard's Bay, will make fire lines, thin and possibly plant.

Frederick W. Burnham, Buckland, is clear-cutting and thinning about 50 acres; will later turn over to State to plant.

I. P. Lawrence, Ashburnham, is planting 25 acres and may do some thinning.

It is hoped that in future we may be able to report a still further increase in this work, and one in keeping with its importance.



Pine trees left standing for reseeding purposes, on the Burbank Hospital property, at Fitchburg.

FOREST WORKING PLAN FOR THE BURBANK HOSPITAL.

A year ago last spring the trustees of the Burbank Hospital asked this office to examine 250 acres of woodland belonging to the hospital. Mr. Cook, the assistant forester who made the examination, was greatly impressed with the evidence of present and future value in the land, and convinced the trustees that they should have a working plan made for the place. This was done in the fall of the same year. In this plan each type of land was carefully mapped out, and the treatment to be accorded each type was explained. In general, the report recommended the cutting of mature growth, the thinning and improving of growing stands, and the planting of such vacant land as was not needed for pasturing cattle.

Three lots were selected for immediate cutting. The first was covered with a growth of mixed hard woods, — chestnut, birch, pine, beech, oak, maple and hemlock. From the standpoint of merchantable volume, chestnut and white pine were the most prominent trees, and ranged in size from 7 to 25 inches, the average being from 12 to 16 inches. The plan for cutting called for the removal of all trees over 7 inches in diameter, breast high, except a few pines which were to be left to seed the cut-over land. The merchantable trees were to be left uninjured as far as possible, limbs and tops were to be worked up into cord wood, and the rest of the slash piled and burned. Practically all the chestnut, oak, pine, birch and hemlock trees were of merchantable size, whereas the maple and beech were very generally below it. The reason for selecting this lot for immediate cutting was that it had been more or less severely injured by fire in past years, and it was feared that the trees were slowly dying.

The second lot was 4 acres of heavy white pine, nearly pure. The trees averaged 15 inches in diameter, breast high, and 70 feet in height. It was estimated to run 35,000 feet to the acre, but turned out to contain much more. This lot was cut clean, with the exception of a few of the large, limby trees, which were left to seed the cut-over land. About 8 trees to the acre, and placed as evenly as possible over the cut area, were selected for this purpose. The spreading, bushy specimens were selected as

seed trees, because they produce the most seed and at the same time are the least valuable as lumber. Here, as on the other lot, the slash was piled and burned.

The third bunch of timber covered only 11½ acres, and was made up almost entirely of sprout chestnut. This lot was selected because the trees were over-mature, had decayed butts and were going back.

The method of handling this work, as agreed upon by Dr. Tower, superintendent of the hospital, and Mr. Cook, was briefly as follows:—

The chopping was to be done under the direct supervision of this office, and Mr. Winifred Eaton, one of our most trusted employees, was made foreman of the chopping gang. This arrangement was made because it was felt that the ordinary choppers could not be depended on to carry out the provisions of the working plan. This office looked on the job as an experiment in conservative logging, and was therefore anxious that everything be done in good faith. The sawing and sticking was done under contract by a Mr. Spencer, a portable-mill man. The hauling of the logs was done by the men and horses belonging to the hospital farm. Partly because these men were not experienced in this work, and partly because they had to pile the logs on skids, to remain until the mill was set up, the cost of logging was higher than is usual in this kind of work.

The following table shows the cost of the above operation:—

OPERATION.	Total.	Per 1,000 Feet.
Camp, material and tools,	\$59 50	\$0 19
Labor on camp,	15 70	05
Repairing old roads,	12 00	04
Chopping 95 cords pine, at 90 cents per cord,	85 50	90 ¹
Chopping 110 cords hard woods, at \$1.10 per cord,	121 00	1 10 ¹
Lumber, 303,000 feet,	463 50	1 53
Sawing lumber,	695 75	2 30
Burning brush,	47 60	16
Logging and sticking,	888 70	2 93
Total, excluding cord wood,	\$2,182 75	\$7 20

¹ Per cord.

The total product was made up of both timber logs (303,000 feet) and cord wood (205 cords). In order to get at the cost of chopping the lumber, we deducted the value of the cord wood chopping, allowing 90 cents for each of the 95 cords of pine and \$1.10 for each of the 110 cords of hard wood, these being the prices current for that work in that vicinity. The cost of chopping is somewhat higher than the average for that kind of work, — approximately 30 cents per 1,000 feet more; but the most of this difference can be laid to the labor of piling the brush for burning, and some to necessity for caring for the smaller trees.

Owing to the fact that a large number of timber lots were cut off in the neighborhood of Fitchburg last winter, the lumber market there experienced a slump, so that the hospital superintendent was unable to dispose of his supply at a price equal to what we had hoped for. For the 175,000 feet of round-edge pine he received \$15 per 1,000 feet as it lay stacked on the lot; for the 53,000 feet of square-edge pine, \$21; and for the 75,000 feet of mixed hard woods, only \$14. The gross returns were \$4,788, — an average price of \$15.80 per 1,000 feet. Deducting from this amount \$2,182, the cost of logging, sawing, etc., the net returns were \$2,606, or \$8.60 per 1,000 feet. This sum is somewhat more than they would have received had they sold the stumpage outright to a lumberman, because an offer of \$8 per 1,000 feet was made for it. Also, under such circumstances the cutting would have been carried out without any regard for the future of the land, and the slash left in such a condition that a bad fire would have been unavoidable. We should estimate that the total extra cost of disposing of the slash on this job was about 40 cents per 1,000 feet of lumber cut.

MARKING FOR GYPSY MOTH THINNING.

In addition to examinations for private owners, and the marking entailed thereby, the work of the forestry assistants was extended over numerous areas in the eastern section of the State for thinning done by the gypsy moth employees. It was felt that the men, after cutting an area so marked, would soon

be able to combine a working knowledge of forestry methods with their already excellent acquaintance with gypsy moth requirements.

A total area of about 490 acres was marked for this sort of thinning, about 425 acres of which lay on the north shore of Massachusetts Bay, in the towns of Beverly, Manchester, Gloucester, Wenham and Essex. About one-half of the cutting done on the north shore was marked for by the forestry assistants, and it is now felt that the men are quite familiar with their methods of work.

Other localities in which marking was done or advice given were Tyngsborough, Tewksbury, Wareham, Hingham, Mashpee and Newton. In the latter place, where a particular effort was made to sell the cord wood product, the amount realized not only paid the cost of cutting, but also of cleaning up the brush, leaving a slight margin of profit.

SURVEYING.

Considerable surveying has been done by the forestry department during the year, including nearly all the unsurveyed lots taken under the reforestation act. These lots, by towns, are as follows: Buckland, 165 acres; Wellfleet, 52 acres; Harwich, 14 acres; Peru, 80 acres; Colrain, 12 acres; Oakham, 100 acres; a total of 449 acres.

Maps have been or are being made for all these lots. Besides this ordinary surveying and mapping, one topographic and forest map (in colors) has been made of a tract of land taken by the State under the reforestation act, and planted and managed by this office, known as the Lowe farm. This land lies in Colrain, has an area of 580 acres, and is the largest of the State plantations.

REFORESTATION WORK.

The reforestation work has been carried on this year under the policy already established, and gives great promise of awakening the interest of mill owners, lumbermen and land owners to the necessity of replanting cut-over and waste lands. The lots planted last year, after being inspected this fall in some cases show as high as 97 per cent. of healthy growing trees, and



A portable steel shack, — one of those in use by the State Forester's department. Size, ten by twelve feet; capable of handling twelve men.



The State Forester's nursery at Amherst. White pine transplants in the foreground.

in no case has more than 40 per cent. died out. Even at this early date some of these lots have started to fill their mission of demonstrating, and influencing land owners to undertake forest planting. One party not owning land suitable for reforestation bought over 200 acres of cheap waste land, and intends planting it in the coming spring. Another party, owning 50 acres of run-out pasture land, became interested through looking over one of these plantations where young pine had been planted on land similar to his own. Many other parties, becoming interested, set out smaller areas.

Deeds for 921 acres have been recorded and the land planted last spring. In order to carry on the work, five galvanized-iron shacks were constructed, which will accommodate from eight to ten men, these shacks enabling the men to live on the lot during the planting season, and doing away with the necessity of transporting the men to and from work, as had been the case when the lot was a number of miles from any town. The average cost of planting was brought to a slightly lower cost through the use of these shacks and other economical methods.

STATE PLANTATIONS, 1910.

Town.	Acres.	Type of Land.	Variety planted.
Colrain, . . .	80	Run-out pasture, . .	Norway spruce.
Colrain, . . .	80	Run-out pasture, . .	Norway spruce.
Belchertown, . .	10	Run-out pasture, . .	White pine.
Colrain, . . .	169	Run-out pasture, . .	White pine.
Colrain, . . .	52	Run-out pasture, . .	Norway spruce.
Sandwich, . . .	38	Burnt-over land, . .	Pitch and Scotch pine and Norway spruce.
Peru, . . .	68	Run-out pasture, . .	Norway spruce and white pine.
Peru, . . .	12	Run-out pasture, . .	Norway spruce and white pine.
Shirley, . . .	14	Cut-over land, . . .	White pine.
Hubbardston, . .	100	Cut-over land, . . .	White pine.
Spencer, . . .	14	Cut-over land, . . .	White pine.
Paxton, . . .	54	Cut-over land, . . .	White pine.
Brookfield, . . .	70	Cut-over land, . . .	White pine.
Oakham, . . .	100	Cut-over land, . . .	White pine.
West Brookfield, .	30	Cut-over land, . . .	White pine.
Carlisle, . . .	30	Cut-over land, . . .	White pine.
Total area, . .	921		

PLANTING DONE UNDER ADVICE OF STATE FORESTER.

NAME.	Town.	Variety.	No. of Trees.
Amherst Water Company, . . .	Amherst, . . .	White pine, . . .	15,000
N. D. Bill,	South Worthington,	White pine, . . .	300,000
Needham Water Company, . . .	Needham, . . .	White pine, . . .	5,000
Leominster Water Company, . . .	Leominster, . . .	White pine, . . .	7,000
Long Island Almshouse, . . .	Long Island, . . .	White pine, . . .	45,000
Dr. E. P. Joslin,	Oxford,	Norway spruce, . . .	5,000
Brown Bros. and John Folsom, . . .	Winchendon, . . .	White pine, . . .	150,000
Fred Barclay,	Spencer,	White pine, . . .	20,000
I. P. Lawrence,	Ashburnham, . . .	White pine, . . .	20,000
Walter Clark,	Paxton,	White pine, . . .	10,000
State Colony for Insane, . . .	East Gardner, . . .	White pine, . . .	14,000
Faunce demonstration farm, . . .	Sandwich,	White pine, etc., . . .	500
W. R. Rich,	Truro,	Pitch pine,	1,000
F. P. Stratton,	Concord,	Norway spruce, . . .	1,000
Henry Pike,	Paxton,	White pine,	1,300

FOREST NURSERY.

The State forest nursery at Amherst will have about 2,000,000 two-year-old white pine seedlings fit for planting next spring. A large part of them should be transplanted in the nursery, if arrangement can be made for sufficient ground. Last spring we were able to use about 900,000 in the reforestation work, and transplanted at the nursery 250,000, that we might have trees which when planted in the most exposed places will grow successfully. We have also a good stand of one-year-old white pine and Norway spruce. The following table gives the estimated stock on hand at the nursery:—

VARIETY.	Age (Years).	No. of Trees.
White pine seedlings,	2	2,000,000
White pine seedlings,	1	2,500,000
Pitch pine seedlings,	2	25,000
Pitch pine seedlings,	1	25,000
Norway pine seedlings,	2	5,000
Austrian pine seedlings,	1	20,000

VARIETY.	Age (Years).	No. of Trees.
Scotch pine seedlings,	1	40,000
Norway spruce seedlings,	1	500,000
Balsam fir seedlings,	2	5,000
Hemlock seedlings,	2	5,000
Red spruce seedlings,	2	2,000
Black locust seedlings,	1	20,000
Catalpa speciosa seedlings,	1	5,000
Total,		5,152,000

VARIETY.	Age (Years).	No. of Trees.
White pine transplants,	4	25,000
White pine transplants,	3	250,000
Norway spruce transplants,	3	25,000
Black locust transplants,	2	2,000
Honey locust transplants,	2	2,000
Total,		304,000

Since the planting of last spring, the large number of applications by land owners to reforest their waste land under the reforestation act make it plain that it will be impossible to replant all the land which would be turned over to the State, unless the present limited appropriation is increased. At this time last year only about 500 acres of land had been offered under the act, the balance for last spring's work being taken over during the winter; this year already over 1,200 acres have been offered. Never before has such interest been taken in the work, and the outlook for the coming months is that many more tracts will be offered; and as under the present appropriation only about 1,000 acres can be planted, steps should be taken by the coming Legislature to meet the situation.

INSTRUCTION IN PLANTING.

While the planting on State land occupies most of our attention during the spring, to the partial exclusion of other work, an attempt was made last year to give practical assistance on the ground to owners inexperienced in forest planting, who

were for the first time trying the experiment on a large scale. Advice of this nature was given to the following owners: —

Faunce demonstration farm, Sandwich, set out 500 seedlings.

Long Island Hospital, Boston harbor, set out 45,000 seedlings.

Fitchburg Water Board, Westminster, started a forest nursery.

E. P. Joslin, Oxford, set out 5,000 seedlings.

Needham Water Board, Needham, set out 5,000 seedlings.

I. P. Lawrence, Ashburnham, set out 25,000 seedlings; also set out 15,000 in a nursery.

State Colony for Insane, Gardner, set out 14,000 seedlings.

Reports from some of this work seem to indicate as good results as can be expected in the short time that has elapsed.

The seedlings at Long Island are in good condition, and it only remains to be seen how they will endure the coming winter.

The stock on the farm at Sandwich is in good shape, and it will be put to a rigid test this winter, having been planted as a windbreak against the heavy gales so prevalent on the Cape.

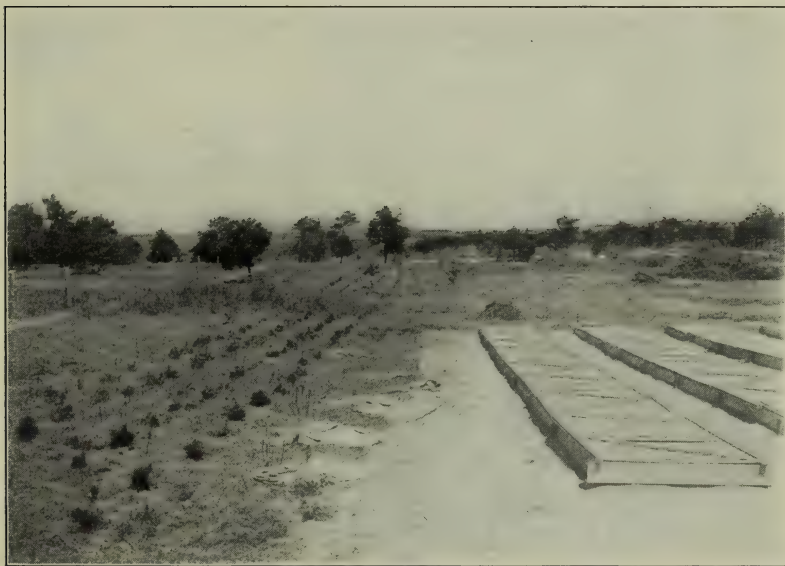
PORTABLE STEEL SHACKS.

In the reforestation work of the past few years we have had difficulty in keeping the expense of planting uniform. There are many conditions that are accountable for it, such as the size and condition of the area, — as a larger tract can be handled more cheaply per acre than a smaller one; price of seedlings, etc.; but the greatest factor to be reckoned with has been the question of caring for the laborers. In some cases it was necessary to transport the men night and morning to and from the field, which was an extra expense. In order to overcome this, the department has constructed several portable steel shacks (see accompanying photograph), which are used to house and board the labor on the ground. These shacks were constructed in the State Forester's warehouse. The whole construction is of galvanized-iron sheets, which are held together with bolts and clasps. The only wooden parts are the door and two window sashes, one on each side. Twelve men can thus be accommodated. The following outline gives the size of the shack, equipment for setting it up, cooking utensils and planting tools used in the work; the approximate cost is also given.

With this device the whole environment of the work is im-



A natural seeding-in of pitch pine on the Cape. The land in the foreground is to be planted by the State Forester.



The beginning of a nursery at East Sandwich, Cape Cod, 1910. Four-year-old white pine transplants on left, set last spring; seed boxes of Scotch and Austrian pine on right.

proved, and the results, from an economic standpoint, are far more satisfactory. These shacks are used only when the plantings are in a locality where it is difficult to get board and room for the men, or where the work is at a distance from boarding places.

COST OF STEEL SHACK AND EQUIPMENT.

Shack.

Size, 12 feet by 12 feet square; height, 9 feet front, 7 feet back,	}	\$75 00
1 sliding window on each side,		
1 door in center of front,		
6 double bunks, 4 feet wide, 2 feet 4 inches between each,		

Equipment.

1 cook stove,	\$5 00
2 lanterns,	2 00
1 kerosene can,	25
1 hammer, axe and saw,	2 50
1 pair wire cutters,	45
2 shovels,	1 20
1 chisel,	75
	— \$12 15

Cooking Utensils.

1 large coffee pot,	}	\$4 00
3 large kettles and covers,		
1 small kettle and cover,		
2 large frying pans,		
1 bean pot,		
3 large spoons,		
2 large knives,		
2 small knives,		
12 cups, plates, knives, forks and spoons,	}	
1 dipper,		
1 dish pan,		

Planting Tools.

6 grub hoes,	\$3 00
12 pails,	2 50
	— \$5 50
1 chest for carrying equipment.	

The bedding is furnished by the men.

FOREST FIRES OF 1910.

It is with considerable reluctance that each year we include in our annual report a chapter on this painful subject, — pain-

ful, because forest fires are the greatest obstacle to the advancement of practical forestry in this Commonwealth, and because they form one of the most difficult problems with which we are obliged to deal; yet for these very reasons this chapter cannot be omitted from this book.

The subject of forest fires has been most vividly presented to the people of the United States during the past summer by the disastrous fires which raged in the northwest. We in our little State cannot experience such enormous conflagrations as these; yet the fire demon each year lays its insidious claws on a valuable portion of our natural heritage.

Last year 215 of the 354 towns and cities of the Commonwealth reported that they had 1,385 forest fires; 28, or 8.6 per cent., said that they had none; and 92, or 27.7 per cent., failed to report. There are 18 towns and cities which have little or no forest land, and therefore do not appoint forest wardens. On account of the large number of towns not reporting, we may be sure that the figures which we have are very conservative. The wardens reported that these fires damaged the woodland to the extent of \$205,383. As we have emphasized in our previous reports, the figures for money damage are very inadequate, as many wardens will not report the damage, because they feel incapable of estimating it; and even when they try, they cannot set a value on the young growth killed and the gradual deterioration of the soil. In the cost of fighting fires, we have data which is not a matter of guesswork, although this is incomplete, because in towns and cities having an organized fire department, where the members are paid a regular salary, the cost of fighting woodland fires of course cannot be obtained. In 1905 the State Forester made a careful canvass of all the towns, and came to the conclusion that the annual cost of fighting fires was about \$30,000. Our figures would seem to indicate that this conclusion was correct. When we spread this sum over the 300 towns in the State, it does not make a very large sum for each individual community; but it must be remembered that this expense is borne in large part by a few towns, and usually the poorest and least able to bear it. An annual bill of \$1,000 for forest-fire fighting is a serious burden on a town whose entire yearly expenditure may not amount to more

than \$15,000. This forest-fire menace is a two-edged sword, for, while it cuts its way into the town treasury, it is at the same time destroying the property which supplies the revenue to that treasury.

The present system of collecting fire reports in this office was inaugurated three years ago, and we thought that it would give opportunity for an interesting study if the data for 1908, 1909 and 1910 were placed side by side. Perhaps the most striking feature is the similarity in the totals for number of fires, acres burned and damage done. Looking at the table more closely, we find some interesting variations. For instance, the figures for March, 1910, greatly exceed those for March, 1908 and 1909. Spring came early last year, and the season of spring fires was present sooner than usual. There were comparatively few fires during the summer, although it was accounted a dry one. On the Cape, where most of the summer fires occur, they had considerable rainfall during July and August. The drought in October is reflected in the fire data for that month. The October fires were very severe, in that they burned in the peat and humus, many of them for weeks, and only severe rains extinguished them.

We find in the table of causes comparisons of more importance and interest. We find, for instance, that the number of fires caused by the railroads has steadily decreased, and we feel that this represents real progress on their part, although plenty of room is left for improvement. The number of fires caused by the burning of brush materially increased, and this would seem to be a cause for disappointment, in view of the general adoption of the present law; but owing to the provisions of this very law, which make it easier to place responsibility, it is the number of fires reported with this cause, and not the actual number of fires caused by burning brush, which have increased.

Fires caused by the careless use of matches in the hands of boys, fishermen, hunters, berry pickers, etc., have been the cause of more concern during the past year than ever before. Although the number under this head is not large, there is no doubt that most of the fires labelled "Unknown" would be placed in this column if they could be traced out; so that we

feel sure that they cause as many fires as the railroads, and are more dangerous, because the smoke is everywhere, while the railroad fire is confined to a certain district, and can be more or less anticipated. The time has not arrived when we can get a sweeping injunction prohibiting all smoking in the woods; but there is no doubt that by the necessary gradual posting of all private land against trespassing this condition will come in time.

As long as we have forest fires, there will be problems connected with them, and their solution will not come all at once; but there are certain features which can and should have immediate attention. In the first place, the office should have the services of a man whose entire time can be spent on forest-fire work. An assistant or chief forest warden, so called, would find a very considerable portion of his time taken up in carrying out the provisions of the fire-equipment reimbursement act; another portion would be well occupied in the collecting and listing of reports; and the remainder could be well used in visiting and assisting whatever forest wardens seemed to require such aid. If the Legislature should add to the authority of the State Forester other duties in the line of fighting fires and making arrests, this assistant would be a very busy man indeed.

FOREST FIRES OF 1910.

MONTHS.	Acres.	Damage.	Cost to put out.	No.
February,	5	-	-	2
March,	12,666	\$57,740	\$3,839	438
April,	13,782	68,867	5,125	413
May,	4,236	13,957	1,738	116
June,	137	980	490	23
July,	1,041	6,509	1,627	76
August,	165	1,275	763	44
September,	2,900	15,035	1,456	25
October,	7,068	40,064	7,885	196
November,	107	400	427	24
No date given,	114	556	125	28
Totals,	42,221	\$205,383	\$23,475	1,385

COMPARATIVE CAUSES OF FOREST FIRES FOR THE PAST THREE YEARS.

CAUSES.	1908.		1909.		1910.	
	No.	Per Cent.	No.	Per Cent.	No.	Per Cent.
Unknown,	314	24.4	360	25.1	413	32.9
Railroad,	494	38.3	497	34.7	362	28.8
Burning brush,	119	9.0	149	10.4	203	16.2
Smokers, hunters, berry pickers, etc.,	161	12.0	140	9.7	124	9.9
Steam saw-mills,	12	1.2	5	.5	1	.1
Children,	71	6.0	92	6.4	75	5.9
Miscellaneous,	118	9.1	190	13.2	78	6.2
Too late for tabulation,	—	—	63	—	129	—
Totals,	1,289	100	1,496	100	1,385	100

COMPARATIVE DAMAGES BY FOREST FIRES FOR THE PAST THREE YEARS.

MONTHS.	1908.		1909.		1910.	
	Acres.	Damage.	Acres.	Damage.	Acres.	Damage.
January,	—	—	13	—	—	—
February,	—	—	12	—	5	—
March,	236	\$420	1,577	\$4,763	12,666	\$57,740
April,	16,262	52,731	12,515	72,195	13,782	68,867
May,	5,856	48,506	4,322	38,080	4,236	13,957
June,	1,195	17,824	405	11,870	137	980
July,	6,109	28,783	11,992	26,396	1,041	6,509
August,	1,567	22,320	1,940	10,833	165	1,275
September,	1,062	3,140	1,092	21,413	2,900	15,035
October,	7,084	29,960	384	1,805	7,068	40,064
November,	301	1,468	585	612	107	400
No date given,	—	—	246	1,515	114	556
Totals,	39,672	\$205,152	35,083	\$189,482	42,221	\$205,383

FOREST-FIRE EQUIPMENT.

The Legislature last spring passed an act authorizing the State Treasurer to reimburse towns, having a valuation of one and a half millions or less, 50 per cent. of whatever sum they might spend for forest-fire-fighting equipment, provided this sum does not exceed \$500, and provided also that the equip-

ment purchased has the approval of the State Forester. As the law was not passed until after the time of the annual town meetings, only a few places have been able to avail themselves of its provisions, and but a small part of the appropriation of \$5,000 was therefore expended. This appropriation, however, is a continuing one, and the same sum will be available next year. It is expected that many towns will vote this spring to spend money for this purpose. Wardens and selectmen of 17 towns have already assured this office that they will urge the matter at the next annual meeting. The following table contains the names of the towns that have received reimbursement, the amount thereof, and the kind of equipment purchased:—

TOWNS RECEIVING FIRE-EQUIPMENT REIMBURSEMENT.

TOWNS.	Amount of Reim- bursement.	Nature of Equipment.
Ashland,	\$15 75	Johnson pumps and pails.
Boxford,	45 60	Chemical extinguishers.
Dighton,	58 67	Extinguishers and cans.
Georgetown,	39 39	Extinguishers, cans and shovels.
Greenwich,	25 95	Chemical extinguishers.
Hanson,	100 77	Wagon and other equipment.
Mashpee,	34 55	Extinguishers and shovels.
Middleton,	49 50	Extinguishers.
Norwell,	50 00	Extinguishers.
Oakham,	138 00	Extinguishers.
Pembroke,	203 75	Wagon, extinguishers, etc.
Phillipston,	48 65	Extinguishers.
Prescott,	48 16	Extinguishers.
Raynham,	50 00	Extinguishers.
Westminster,	55 91	Extinguishers and cans.
West Newbury,	24 00	Extinguishers.

In addition to the above list, the towns of Bedford, Charlton, Hanson, North Reading, Tewksbury, Sterling, Sandwich and Wrentham have already purchased equipment, the reimbursement on which will amount to \$1,600; but, as their accounts were not received before November 30, we were not able to list

them in our table. All of these towns except Charlton purchased a full wagon equipment.

In this connection it is pertinent for us to call attention to our two model forest-fire wagons. These were built by the State Forester in order that the officials of the towns wishing to purchase forest-fire equipment may see what we consider an ideal form of apparatus. The plan of this outfit was made up only after a careful study had been made of existing forest-fire apparatus in several towns.

The larger wagon is intended for two horses, and costs, all equipped, about \$450. The equipment consists of fourteen chemical extinguishers; fourteen galvanized cans, each holding two extra charges of water and chemicals; shovels; rakes; mat-tocks; and spare chemical charges. This equipment is carried in racks and cases, not only so that it will ride safely, but also so that it can be conveniently carried into the woods. Eight men can find accommodation on this wagon.

The smaller wagon, drawn by one horse, has all the equipment of the larger, but less in amount. It will carry four men, and costs, all equipped, about \$300. These two wagons were exhibited this fall at the Marshfield, Barnstable, Worcester, Clinton, Barre and Palmer fairs, where they attracted general interest. The New Haven, Boston & Maine and New York Central railroads aided us in this exhibition work by transporting the wagons over their lines without charge. A small pamphlet describing these wagons has been published by this office, and may be had on application.

FOREST-FIRE DEPUTIES NEEDED.

The State Forester wishes to repeat what was suggested last year under this head:—

The forest warden law has undoubtedly been tested far enough to be pronounced a success as another step in perfecting our organized efforts against forest fires. I now propose the idea of empowering the State Forester to appoint deputies at large to assist him. Many of our forest wardens need instruction and co-operation in getting their work well in hand. The best way to teach these men just how to accomplish results in fighting forest fires is to confer with them right on the ground, and

demonstrate what can be accomplished and how it can be done. There are experienced men whom the State Forester could in times of emergency delegate to assist, and, if need be, with authority to take charge.

In the case of the gypsy and brown-tail moth agents, these men are at present mounted on motor cycles, and hence are familiar with the country. They are already State employees, and men interested in the preservation of the forests. They will gladly acquaint themselves with modern methods of fighting forest fires, and, were they appointed deputies authorized to assume responsibility, the State would have their services at no extra compensation. Of course this would apply only throughout the moth-infested territory, but other plans could be worked out for the remainder of the State at a minimum cost.

DISPOSING OF THE SLASHINGS OR BRUSH.

As a result of the discussion of this matter in the last annual report, the State Forester has had many inquiries and has discussed the matter with practical men. That the slashings left from limbing are a great menace, and one of the basal dangers causing forest fires, there can be little question. At the present time this office is carrying on some experiments to determine the expense of handling the slash, and the results are looked forward to with much interest. No one desires to hinder the wood-lot operator, or to cause him any extra expense; but when the expense of piling and burning the brush is once determined, it can be dealt with as a part of the business transaction. We must conserve for the future welfare of the town and Commonwealth, as well as for the present. It is high time, therefore, that some reasonable State regulations should be made.

FOREST-FIRE LOOKOUTS.

Last year attention was called to the value of forest-fire lookouts, and the advisability of our experimenting somewhat, to determine whether their use would be applicable to our conditions. We were unable to spare any of our regular appropriation for doing anything in this line; and hence, with the exception of the Plymouth tower, which was erected by the town of Plymouth a few years ago, there are no others in the State.

Since our last report New Hampshire has established several lookout stations, and the results derived from their first season's use are very satisfactory.



The slash remaining following the lumbering of a pine lot at Concord. Here is where we must guard against fire.



The brush or slash conditions following lumbering of a mixed growth at Petersham. This is typical of most sections, and forms the base or tinder-box that causes our destructive forest fires.

Maine has a number of these lookouts scattered throughout the so-called wild or forest lands, and the State makes an annual appropriation of \$60,000 a year for these stations and for fire-patrol work. The work of the Forest Commissioner of Maine is primarily that of forest-fire protection.

New York has forest-fire lookout stations established throughout the Adirondacks, and values them very highly.

The point may be raised that the States named have a much larger forested area than has Massachusetts. This is true; but this State is quite thickly populated, and the dangers from fires are therefore proportionately greater, as man himself seems to be the destructive force. There is no doubt that the small outlay required for the services of men to attend a few lookouts at high points in this State, together with the installation of telephones, would have been repaid many times over during the past season in the saving of forest values by stopping fires in their incipency. There is nothing like having a system for getting results. If this outlook plan could be added to the present forest warden system, it is believed that it would be an economic step in the right direction.

FIRE LINES AND PROTECTIVE MOTH BELTS.

Each forest warden should plan to interest his town in doing something in the way of making fire lines. By making a beginning and doing a little each year the importance and value of the work will demonstrate itself. The widening of all wood roads or cleaning a strip and running plowed furrows, together with separating the debris, etc., if done in advance, precludes the danger from fires, so common at present. This winter this department has been fortunate in finding enough of this sort of work, largely on private estates, to employ a number of our men in making fire lines. By finding the men employment at this season, we shall be able to keep them the year round. Men familiar with the work and understanding modern methods accomplish much more than inexperienced men.

These fire lines may be utilized for operating the lots, as occasion demands; also, they enable one to combat the dreaded moth pests.

RAILROAD CO-OPERATION IN FOREST-FIRE FIGHTING.

During the past season there have been many evidences of co-operative assistance on behalf of the railroads with the State Forester and the forest wardens in preventing and fighting forest fires. Invariably when assistance has been asked from the main office of the railroads or the local section men, it has been furnished. In one instance of a fire which had not been set by the railroad, a forest warden reported that twenty-five men in the employ of the railroad came to his assistance without making any charge to the town for their services.

There were many instances where engines were reported as evidently having inefficient spark-arresters, and hence they were throwing out cinders and setting fires; but it is believed that in each case they were overhauled and improved.

Certainly there is already a great difference in the feeling of our rural people towards the railroads; and this is equally true, we are inclined to believe, of the railroad people as regards the protection of our woodlands and forests.

When the State Forester came to Massachusetts, in 1906, it was the consensus of opinion that the railroads were the great offenders in burning up our forests. If there was a railroad in the vicinity of the fire, it was always held responsible. Since our forest warden and permit laws were enacted, and we have been enabled to get at the real causes of forest fires, it is plainly shown that there are many causes for forest fires other than the railroads. The railroad fires, however, are still very numerous, and there are great opportunities for improvement; but let our forest wardens in each town co-operate and work harmoniously with all forces toward getting better results in checking and eliminating forest fires. All we desire is to get the exact facts, and then we shall be in a position to better the conditions.

The railroad officials are business men, and can be convinced of their duties as readily as any class of people. Instead of a forest warden finding fault and getting disgusted over railroad fires, the thing to do is to get direct proof and evidence, by having the number of the engine, the time of day, the date, etc., and then taking it up with the proper authorities. One warden has succeeded in getting the railroad people to keep some barrels

filled with water on the right of way upon a bad up-grade which runs through woodland in his town. This same road has also supplied the section men on this section with two three-gallon hand extinguishers. Forest wardens little realize what they can accomplish until they try.

POWER SPRAYERS AS FOREST-FIRE EQUIPMENT.

Attention was called in last year's report to the use of power sprayers in putting out forest fires. From our experience with the modern sprayers, which can be turned around in a small space, and hence may be readily handled, even in wood roads, they should be used more often. These machines can be adjusted to spray directly from the brook, pond or tank, so that they are adaptable for service when other equipment would be useless. If for no other purpose than to carry water, they can be made very serviceable, as they can be filled by their own power in about five minutes. The capacity of the tank is usually 400 gallons. As these sprayers are capable of throwing a stream to the top of the tallest trees, it is readily seen what a radius of fire could be reached and deadened by them. They have sufficient power to maintain a 300-pound pressure at the end of a 1,500-foot length of 1-inch hose. These same machines could also be used to great advantage for house fires in the country. As our towns need such a device for the protection of their trees, why not get all the good possible out of them?

FOREST FIRES IN GERMANY.

A recent letter from Mr. F. B. Knapp, a Massachusetts man who is spending the year abroad with the Biltmore Forestry Schools, says: —

They have practically no forest-fire problem here, and I should say that it is chiefly due to *respect for law and order*.

The State Forester appreciates the above statement, for it comes from a man who has shown much interest at home in these matters; in fact, he is the forest warden of Duxbury, where good work has been done.

STATE SUBSIDY TO TOWNS FOR FOREST-FIRE PROTECTION.

The law enacted last winter, which assists all towns having a valuation of one and one-half millions or less in purchasing fire equipment to the extent of 50 per cent., or an amount not exceeding \$500, was passed too late to be taken advantage of by most towns, as their annual town meeting had been held.

At the coming spring town meetings it is believed that many will accept the assistance. The State Forester has a brief pamphlet in press that will be sent to all towns in time for their consideration before the spring meetings.

PUBLIC ADDRESSES.

As many engagements have been filled throughout the year as the State Forester could accept, and at the same time consistently carry on his other duties. The custom of placing the responsibility upon organizations of securing an audience of at least one hundred has made our efforts more effective and better appreciated. It has been practically impossible to meet all the demands from local clubs and private organizations; hence we have invariably requested that, in so far as possible, these meetings be thrown open to the public.

The usual course of lectures was given at the Massachusetts Agricultural College during January.

LECTURES BEFORE SCIENTIFIC ORGANIZATIONS.

The State Forester has had several requests to lecture outside the State, as well as at home, and the following were accepted: Lehigh University, Bethlehem, Pa., in their special lecture course on forestry; the New Hampshire Horticultural Society, annual meeting at Manchester; the Society for the Promotion of Agricultural Science, annual meeting at Washington, D. C.; the American Society of Economic Entomologists, annual meeting at Boston; the Economic Club; Williams College, at Williamstown; the Massachusetts Reform Club; High School Principals Association; the Society for the Protection of New Hampshire Forests, at Bretton Woods, N. H.; etc.



A plantation of white pine, thirty years old, at South Orleans, on the Cape. Who says white pine will not grow on the lower Cape?

STATE FIREMEN'S ASSOCIATION.

The annual meeting of the State Firemen's Association was held at Lowell during the week beginning September 19, and the State Forester addressed the organization on Thursday evening, September 22, on the subject, "Forestry, and Fire Menace of the Same."

This organization has been ready to co-operate and assist the department at all times, and their good offices have been highly appreciated.

During the past summer, at a meeting of the officials of the above association and the State Forester, it was agreed that the fire-permit act should apply to cities as well as to towns.

THINNING BULLETIN.

The bulletin by the State Forester's assistant, Mr. H. O. Cook, on "Thinning," referred to as being in press last year, was received from the press early in the year, and has proved of great value in assisting us in getting this information into the hands of those who contemplate improving their woodlands.

This bulletin is opportune, as it meets a definite place in the handling of woodlands in the worst moth-infested sections; and it helps not only in making better forestry conditions, but, with the poorer trees and dead wood removed, the work of spraying and treating woodlands is greatly simplified.

BULLETIN ON REFORESTATION AND NURSERY WORK.

Reforestation and the growing of young trees is at present a subject of great interest to our people. In order to give detailed and exact knowledge, the bulletin was carefully planned and published, and we have every reason to believe that it covers the subject as clearly and as practically as any publication available. It was written by Mr. R. S. Langdell, assistant in charge of the State nursery at Amherst, who also has charge of the reforestation work throughout the State. We believe it hits the nail on the head, and is of great assistance in the State work.

THE CHESTNUT BARK DISEASE.

This disease, as reported last year, does not seem to have caused any great amount of damage as yet in this State. We had received but one direct notice of its appearance here, when a letter came from Dr. Haven Metcalf, stating that he had reports of four outbreaks in Massachusetts. The State Forester has taken the matter up with Dr. Metcalf, and has also written to Prof. George Stone of the Agricultural College at Amherst. If occasion demands, further notice will be given, calling attention to the disease and showing how the infested trees should be treated.

The precaution mentioned last year will apply not only to the chestnut, but to all trees; namely, that any tree that becomes unhealthy, particularly in the woodlands or forest, should be removed, thus minimizing the danger.

CONFERENCE OF STATE FORESTERS AND FOREST WARDENS.

A meeting was held at Bretton Woods, N. H., during the first week in August, under the auspices of the Society for the Protection of New Hampshire Forests, at which various State foresters and forest wardens held a conference. The State Forester and many other Massachusetts people attended, including Mr. Guild, secretary of the Massachusetts Forestry Association, Congressman Peters, Forest Warden Knapp of Duxbury, etc. The meeting proved a very interesting and instructive one. The following paper was presented by the writer:—

THE MASSACHUSETTS FOREST WARDEN SYSTEM.

Massachusetts has had the town forest warden system in practice long enough to feel that it is a pronounced success. The idea of having an authorized town, and, in a sense, a State official in each town who is clothed with sufficient power to get results in a broad forestry movement, makes a splendid nucleus for better future results.

It is the aim of the State Forester to secure for these positions public-spirited citizens who have their town interests as regards forestry matters at heart, and then get them all the assistance possible. When a man is broken in, the aim of the State is to retain him in the work.

The duties of the forest warden in Massachusetts are multitudinous, and he will never lack for things to do. The following are some of the forest warden's main duties:—

Interest in all forestry matters. Appointed by selectmen, subject to the approval of the State Forester, he has the power to appoint and discharge deputies. State Forester's power to hold meetings for educating forest wardens. Forest warden chief forest fire fighter in the town. Forest warden source of information on reforestation in the town. Forest warden, ideas on thinning and pruning trees. Forest warden read or have read fire laws in schools. Forest warden post fire laws and warnings. Forest warden deal with railroads in his town. Forest warden have ideas on forest taxation. Forest warden assist State Forester on forest data, maps, etc. Forest warden tell when seed and seedlings are plenty. Forest warden start a town nursery. Forest warden, amount, kind and price of cheap lands. Forest warden, town lands accepted and planted. Forest warden encourage forestry in town schools, grange, farmer's clubs, woman's clubs, etc. Forest warden handle town insect troubles. Forest warden assist in encouraging beneficial birds. Forest warden plan fire campaign, fire belts, have fire extinguishers well placed, telephone calls, etc. Forest warden, power to arrest without a warrant within certain restrictions, etc.

The whole purpose, as I see it, is to adopt modern ideas and systematize our efforts along well-defined channels, whereby results are made possible. The working out of a forest warden system in a thickly settled State like Massachusetts might not adapt itself to some sections of Maine and northern New Hampshire, but with modifications it could be made to do so. In Massachusetts about 5 per cent. of the forest products used are grown in the State; hence we have a good market, and with modern methods of forestry management, made possible through local and State officials, the value from possible forest products can be made very great. What is true of Massachusetts is equally true in other New England States in more or less degree.

EXPENDITURES AND RECEIPTS.

In accordance with section 6 of chapter 409 of Acts of 1904, as amended by Acts of 1907, chapter 473, section 2, the following statement is given of the forestry expenditures for the year ending Nov. 30, 1910:—

FORESTRY EXPENDITURES.

Salaries of assistants,	\$5,346 47
Travelling expenses,	1,001 78
Stationery, postage and other office supplies,	369 37
Printing,	960 37
Instruments,	48 55
Forest warden account,	499 92
Nursery,	2,222 15
Sundries,	143 13

\$10,591 74

REFORESTATION ACCOUNT.

Seedlings,	\$2,204 70
Land,	1,035 00
Labor,	5,124 68
Equipment,	694 63
Travelling,	670 83
Express,	311 21
Sundries,	57 74

\$10,098 79

Turned over to the treasurer for publications,	\$102 60
Turned over to the treasurer for seedlings,	243 50
Turned over to the treasurer for cord wood,	118 13

\$464 23

Reimbursement to towns for fire-fighting apparatus,	\$1,469 56
Unexpended balance,	3,530 44

Total appropriation, \$5,000 00

In accordance with section 5 of the above-named chapter, the following statement is given of the receipts for travelling and subsistence:—

LECTURES.

Mansfield Men's Club,	\$1 00	Hingham Association,	\$1 70
Andover Grange,	1 20	Massachusetts Board of Agriculture,	5 69
Newburyport Neighborhood Club,	30	Cornell Club,	1 50
Rockport Men's Club,	90	American Forestry Association,	25 00
Saugus Laymen's League,	1 10	Course of Lectures, M. A. C.,	— ¹
Littleton Women's Club,	1 42	Woronoco Club, Westfield,	5 40
Malden Board of Trade,	2 00	Newburyport Club,	3 00
Somerville Board of Trade,	20	Pilgrims' Club, New Bedford,	2 50
Bellingham Pomona Grange,	1 40	Williams College,	11 34
Foxborough Grange,	3 15	Middlesex Sportsman's Show,	1 04
Boston Public Library, Field and Forest Club,	3 00	Newton High School,	75
Quincy Men's Club,	5 00	Winchester Unitarian News Club,	1 96
Buzzards Bay,	2 40	South Bristol Farmers' Club,	3 00
Athol Improvement Society,	4 04	Worcester Horticultural Society,	— ¹
Bolton Pomona Grange,	1 50	Heptorean Club,	1 50
Boylston Grange,	2 50	Phi Delta Theta Club,	2 25
Fitchburg Pomona Grange,	2 28	Farmers' Week, M. A. C.,	— ¹
Harvard Grange,	1 84	Fish and Game Association,	— ¹
Phillipston Grange,	3 50	Palmer's Woman's Club,	4 00
Amesbury Improvement Society,	40	Winchendon Board of Trade,	5 00
Hatfield Men's Club,	5 00	Winchester High School,	1 21
Bristol County Academy of Science,	2 00	Barre Library Association,	4 48
		Danvers Bird Club and Grange,	1 25

LECTURES — *Concluded.*

Wellesley Grange,	\$3 00	State Fireman's Association, . .	\$3 50
Massachusetts Reform Club, . .	1 22	Hanover Fireman Muster, . . .	1 50
Pepperell Woman's Club, . . .	2 00	New Hampshire Horticultural So-	
Lehigh University,	24 31	ciety,	5 50
Pierce School,	1 07	Springfield Board of Trade, . .	5 00
Institute State Board of Agri-		Roxbury Woman's Club, . . .	2 00
culture,	7 45	Massachusetts Forestry Associa-	
Grange field day, West Newton		tion,	— ¹
and Yarmouth,	10 59	Society for the Protection of New	
Montwait Chautauqua,	1 15	Hampshire Forests,	25 10
Cape Cod Cranberry Association,	2 20	American Association of Economic	
Franklin County Pomona Grange,	8 11	Entomologists,	2 00
State Prison teachers,	1 30		

¹ Paid.

EXPENSES INCURRED IN EXAMINATION WORK, CHARGED TO OWNERS.

Allen, P. R.,	\$0 70	Main, F. H.,	\$5 44
Bent, F. E.,	50	Massachusetts Agricultural Col-	
Borden, N. E.,	74	lege, Faunce demonstration	
Boston & Northern Street Rail-		farm,	5 00
way,	1 32	Minns, Susan,	2 50
Brayton, A. P.,	2 00	Minot, W.,	2 00
Brochu, J. E.,	1 40	Morey, E.,	1 00
Burnett, H., trustee,	70	Nelson, H. W.,	1 20
Chandler, F. F.,	62	Pickman, D. L.,	1 50
Cummings, W. O.,	62	Robinson, C. E.,	2 85
Cushing, J. S.,	50	Sawyer, A. H.,	1 50
Dewar, D. W.,	1 25	Sears, Julia M.,	1 40
Eddy, Mary B.,	15	Seavey, H.,	50
Emerson, Dr. N. W.,	18	Simmons, H. F.,	1 25
Forrest, W. P.,	1 00	Stevens, E. A.,	1 50
Fowle, D. H.,	1 80	Stevens, H. H.,	1 14
Fuller, W. A.,	1 50	Stone, G. (W. Manning), . . .	2 35
Gerrish, Isabel F.,	1 00	Tenney, C. H.,	1 16
Green, F. C.,	2 40	Tracy, Harriet E.,	2 85
Harriman, C. S.,	68	Webber, F. S.,	3 05
Horne, W. N.,	90	White, J. H.,	1 20
Hunnewell, H. H.,	50	Fitchburg Water Board, . . .	2 00
Jones, J. L.,	1 20		
Lawrence, I. P.,	6 50	Total,	\$71 37
Mahoney, T. J.,	1 82		

EXPENSES INCURRED IN SUPERVISION OF MANAGED WOODLANDS, CHARGED TO OWNERS.

F. C. Green,	\$4 80
R. B. Symmington,	20 00
	\$24 80

EXPENSES INCURRED IN GIVING INSTRUCTION IN PLANTING, CHARGED TO OWNERS.

E. P. Joselin,	\$2 35
Long Island, transportation furnished,	—
Fitchburg Water Board,	4 85
Needham Water Board, no expense,	—



PART II.

GYPSY AND BROWN-TAIL MOTH
SUPPRESSION.

PART II.

GYPSY AND BROWN-TAIL MOTH SUPPRESSION.

CONDITIONS IN 1910.

The moth work during the past season has gone forward with more precision and earnestness than ever. The year's results have been very encouraging, in spite of many negative conditions.

First, in January there was a heavy fall of snow over all the infested territory, which lasted in many localities, especially on some private estates, until late in the spring. In these places, where the cleaning had not been done previous to the snowfall, it was impossible to do thorough work before the caterpillars began to hatch. These conditions prevailed where property owners had neglected to care for their property. Next, in the spraying season the work was hampered to a great extent by cold and rainy weather in June. The growth of the foliage was practically at a standstill, while the caterpillars continued to develop. Much good and effective work was done, however, and the results were better than the climatic conditions gave us cause to expect.

Burlap and tanglefoot were not used as much during the summer of 1910 as previously, but the results obtained have been nearly as good. While it may seem in looking over the territory that the infestation was more severe than in 1909, because no burlapping was done, yet, setting against the expense of the burlap, putting it on and tending it, the expense of treating the egg clusters left in the winter, the cost of caring for an infested area will be seen to be considerably less, the infestation in nearly all residential sections being now very light.

Where spraying is done effectively on street trees and on contiguous property, it is not economical to burlap also. If burlap could be used, and only turned once or twice, say about the time caterpillars are pupating, the results might pay; but where they are tended during the whole caterpillar season, the results do not warrant the expense. Tanglefoot has been used mostly in orchards, small wooded areas or in protective belts, and is economical thus used.

Spraying in residential sections against the gypsy and brown-tail moths has been confined mostly to wooded roadsides, private property and small wooded areas, where the infestation menaced orchards or shade trees. The greater part of the spraying which has been done on street trees this year has been done against the elm-leaf beetle, and paid for locally out of appropriations for the purpose; the moth department allowing cities and towns to use apparatus belonging to them in the fight against the beetle, as we believed that some benefit to the moth work might accrue in the spraying of the trees. This was where the gypsy moth infestation was so slight as not to warrant spraying for it alone.

SCOUTING.

In the known infested district the scouting for gypsy and brown-tail moths has been mostly done by the city and town gangs. But little scouting was done except in towns where the infestation was light. In the new territory, that is, in towns bordering on those known infestations, scouting has been done by the government employees. This work has been of great help to this office and to the moth work in general.

Scouting done by town or city gangs in newly infested places is not apt to be very thorough, as the men are for the most part inexperienced, have seen but few gypsy moth egg clusters, and are liable to miss infestations, which thus remain unknown until they become severe enough to attract the attention of the novice. If this work is done by experienced men, much better results are obtained.

In towns where the infestation is very light, it requires but a part of the year to do the necessary work; therefore, there is no permanent employment for a gang of men, and it is not



Before thinning, at Manchester-by-the-Sea. Imagine the difficulty in treating this woodland for gypsy moths as it is.



After thinning, at Manchester-by-the-Sea. Not only are the conditions better for combating moths, but the improved forestry conditions are evident. Further, the cordwood helps to meet the expense.

possible to train them and have an experienced force. If the law under which we are now working were so amended that the State Forester might carry on the work in several towns adjoining each other, where the infestation is of a similar character, and employ a steady force of men to do the necessary work, much better results could be obtained. In order to employ good, steady, faithful men, they must be given fairly permanent employment; and in any business where good results are to be obtained, experienced men must be employed. The infestation in nearly all of our towns — we will say, for instance, a greater part of the towns in Worcester County — has started with colonies of but one or two egg clusters, and these have gradually increased, until in some of them hundreds and thousands and tens of thousands of egg clusters are now found. This should not have happened, and if the work might have been directed by, or taken up under the personal supervision of, this office, much better results would have been obtained. Until the infestation in cities and towns in what is known as the outer district becomes severe, so that the men employed in the work become better acquainted with the habits and appearance of the gypsy moth, efficient work, as a rule, is not accomplished. The agents and division superintendents who are employed by this office experience a great deal of difficulty in controlling the methods and plans of doing the work in such towns as mentioned above. But if a gang of men, for instance, were employed to do the work in five towns, the agents and division superintendents would only have to look after one town at a time, instead of five, and in this way supervision would be made easier. The best arrangement for this would be to have it optional with the State Forester as to the towns in which it would be necessary to do the work in this manner, and have it understood that the cities and towns where the work is to be done should be assessed for the work to the extent of their legal liability, payment to be made every sixty days. In most cases in sixty days all the necessary work could be done, generally in the fall and winter months; it would be necessary to make some expenditures in doing summer work, but not on as large a scale as in the months when the gypsy moth is dormant. On the

other hand, where this scouting is done by local inexperienced forces, the work must be inspected after them, and it means a double expenditure, — one by the town, and one by the State. This seems to us unnecessary.

If this work is done in the first place by competent men, very little inspection is necessary, — not more than an experienced foreman would be able to give to the work of the scouting gang.

The scouting done by the federal forces has disclosed new infestations in several towns. The following towns were scouted by them, and those marked with an asterisk were found to be infested: —

Ashburnham.*	Ludlow.	Warwick.*
Athol.*	Palmer.	Webster.*
Barre.*	Petersham.*	Winchendon.*
Brookfield.*	Rutland.*	Gardner.*
Charlton.*	Spencer.*	Orange.*
Dana.	Sturbridge.*	Paxton.*
Douglas.*	Uxbridge.*	Royalston.*
Dudley.*		

SPRAYING.

Spraying with arsenate of lead during the season of 1910 was done on a larger scale than ever before, nearly all residential sections being sprayed, the greater part of the infested private property, and more woodland than in any previous year, and the results obtained were satisfactory in nearly all places. More territory was covered in a shorter space of time than in any previous year. This was principally due to two causes: first, city and town forces were generally more experienced, and educational work could be eliminated; second, improved apparatus was generally used. It was mentioned in our last report that this office was conducting some experimental work in spraying apparatus, and the results of this work proved to be very helpful. The spraying machines which were designed by us were far superior to anything previously used. They were much lighter, and capable of maintaining more pressure than those used in the past seasons, and break-downs were so few that no inconvenience worth mentioning was experienced. The fact that these machines can easily be filled from ponds or

brooks was a feature of great importance, as much less time was wasted in this operation, — five to six minutes being about the usual filling time. Several times it was noticed that from the time of filling to the time when the gang began spraying again it was only eight or nine minutes, while in previous years the time of filling was eighteen to twenty minutes, and about twenty to twenty-five minutes was the usual loss of time in filling. Taking into consideration that from eight to eleven men were employed on each machine, and about twenty machines were used in the State, the saving with improved apparatus, in time alone, was a considerable one.

In discharging, some time was also saved, the usual time being twelve to fourteen minutes, although it was necessary for the men to work much faster than with the old apparatus. Twenty-three and one-half acres have been thoroughly covered in one day, and this was in heavy, high growth. In designing these machines, as they were costing us a high price, we were very particular that we should have good material in the apparatus. We bought extra good caravan running gears with wide tires, circular rocker plate, and cut under, so that the machines could be turned in their own length. No trouble was experienced during the whole year with any part of the running gear. Some were fitted with brakes, and some were without; but it has been decided that the brakes on the running gear are much needed in the general work. The pumps were formerly of cast iron and brass, but phosphur bronze was used in the new ones, which is a much harder metal. It will stand higher pressure, and therefore it is not necessary to have such large, bulky pumps, and this eliminates a large number of pounds in weight. Metal valve seats were used, instead of rubber. The four-cylinder engine was found much more effective, as it did the work more easily than the two-cylinder engine. A safe comparison is the difference between one horse drawing a two-horse load, or two horses drawing the same load. In the coming season it has been decided to use mechanical oilers, as the ones previously used were neglected by the engineers, and caused some trouble when engines were being started, as the crank base would have an over-supply of oil. Also magnetos will be used

in place of batteries, as about the only trouble we experienced in the past season was in adjusting vibrating coils, which were connected with the batteries. In using magnetos we feel that all trouble of this kind will be eliminated, and also the wiring, to a great extent. Batteries are liable to get wet, where so much water is being used, and in this way lose their strength.

The nozzle, which was also mentioned in the last report, has proved to be probably the largest money saver of any piece of improved apparatus which has been used in the field since the work began. When the machines are running all right, climbing the trees in order to spray the tops is not necessary; and in some cases all the street trees in a town or city were sprayed without any climbing whatever, by using a long nozzle. In the spraying of 3,000 acres of woodland, which was done under the supervision of this office, a saving of from \$5,000 to \$6,000 was made by the use of the new nozzle. Much better results were obtained, as in using an old nozzle oftentimes climbing was not done when it should have been, and the tops of the trees were not covered with poison. Later in the season this was very noticeable, as the caterpillars ate the unsprayed parts first. This was practically eliminated this year. Some difficulty was experienced in getting enough nozzles to cover the entire field at the proper time; but next season we hope to have enough on hand so that every power sprayer will be properly fitted with a new nozzle. In some towns towers on sprayers were also used in spraying street trees, but we do not find them as satisfactory as we hoped. Where there are trolley wires, especially, with these towers, it is necessary for the spray team to go very near the trees; and the force of the water goes too directly on to the leaves, and a strength of poison sufficient to kill the caterpillars does not remain. This fact has been noted several times in the solid-stream spraying; but in looking over the field during the past season we find that the same trouble still exists in some cases. It must be borne in mind at all times, when spraying is being done with solid stream, that the operator of the nozzle must stand a sufficient distance from the tree so that the solution will reach the foliage in as near a mist form as possible.

In a greater part of the district nearly all spraying is now being done with the solid stream, although some cities and towns



Our new power sprayer complete. This outfit was planned and built by the State Forester's department. Four-cylinder engine, triplex bronze pump, 300 pounds pressure capacity, weight 3,000 pounds.

still believe that it is necessary to use the mist spray and small hose, and climb trees. This method of work should be eliminated as fast as possible, as it has been proved conclusively that in a very large part of the street tree and orchard work solid-stream spraying is more effective, more economical, and larger areas are covered in less time, — time being one of the chief assets in the spraying season.

Another feature connected with spraying which must be guarded against in the future is the mixing of arsenate of lead in the barrel. When it is first opened, that is, before any of the material is weighed previous to putting it in the tank, it should be properly stirred and equally mixed. We have found it to be a fact that there is a much weaker solution at the top of the barrel than at the bottom; and if the poison is not stirred in the barrel, before using, the results are poor, from the use of the weaker poison. This insufficient mixing of the arsenate of lead is often the cause of uneven results of spraying; and it is hoped that before another caterpillar season some mechanical method may be applied to mixing the poison. However, if this should not be perfected at that time, more care must be used in stirring the poison by hand.

The fullway coupling, which we used this last season, did not prove as good as we hoped. The marline cover would not hold in under the coupling, although we received the benefit of the waterway, and do not feel that anything was lost by the use of this coupling. Probably with the improved sprayer in the coming season better agitation will also be possible, as new agitators will be used. We hope that those in charge of the work will be in readiness to start next year with the spraying apparatus in perfect condition, so that no break-downs or obstacles of any kind may hinder early spraying; as we find that it is much more effective when done early than when it is done late in the season, when the caterpillars are larger, as they then do not confine their eating to one place as steadily as when young.

This office not being able to furnish all towns with power sprayers during the season of 1910, the use of travelling sprayers belonging to this office was introduced, and excellent results were obtained. The worst infestations in different

towns and cities were sprayed, and it is hoped that during the season of 1911 several more sprayers will be added to the number. In the following cities and towns the travelling sprayers were used: Malden, Melrose (Pine Banks Park), Woburn, Burlington, Billerica, Hamilton, Ipswich, Topsfield, Boxford, Georgetown, Rowley, Newbury, Andover, Tewksbury, Methuen, Wayland, Natick, Sudbury, Acton, Littleton, Westford, Tyngsborough, Townsend, Marshfield, Kingston, Carver, Middleborough, Cohasset, Norwell, Scituate and Waltham. They were also used on the North Shore at the last of the season.

FUTURE WORK.

In view of the fact that so much good work has been accomplished in the thickly settled sections, and conditions are much improved, it will be necessary in the future to eliminate some of the methods previously used in such sections, and use the money thus saved in other districts. The creosoting of gypsy moth egg clusters must be generally done the same as before, and the removing of brown-tail webs where absolutely necessary; but in some sections, where conditions are good, spraying may be omitted. By this method, towns and cities will be able to do work in other sections where it has not been possible in the past to do thorough work. Some of these sections are as follows: brush near stone walls on roadsides, where a continual infestation is found on the street trees in the vicinity. This does not apply to wooded roadsides, but to open country. Decayed orchards, where tinning is needed and worthless trees are to be removed. This work will prove very beneficial in the future, as it will help make the work done on private property of more effect, preventing reinfestation. Also, work should be done on some small wooded areas, which are a menace to adjoining property; here creosoting and spraying should be done. When spraying is being done in places which have been cleaned thoroughly in the past, especially in orchards, arrangements should be made with the owners to have the same paid for, owing to the great amount of benefit to the orchard, not only by the destruction of the gypsy and brown-tail moths, but by the improvement in the fruit in general, its marketable price advancing enough to more than pay for the spraying.

SUPPLY STORE.

On Dec. 1, 1909, this office opened a supply store, and such supplies as are used in the moth work were furnished cities and towns receiving reimbursement from the State. With few exceptions, it has received the highest commendation from those engaged in the work. The matter was also gone over with the State supervisor of accounts and State Auditor, and met with their complete approval. All supplies were purchased through public estimate, and the lowest prices were obtained. Arrangements were made with the successful concerns, that such supplies as might be needed during the season would be furnished at a uniform rate. Supplies to the amount of about \$86,000 have been purchased, of which \$68,103.58 has been furnished cities and towns. The average saving in general supplies has been \$12,028.72, this being a very conservative estimate. The general saving has been about 17 per cent.

Not only has our supply store been used for the supply business, but it has been used in assembling power sprayers and power pumps and storing fire wagons, and, as it is centrally located, it has been convenient for parties wishing to examine wagons. The supply store has been one of the many advances made in this year's work, not only from a financial standpoint, but in efficiency of the work. In nearly all lines better material has been furnished. Previously, a great many towns doing moth work did not have the necessary tools, and were continually getting out of supplies, thus necessitating that the local superintendent spend some time in purchasing supplies, and, in a great part of the towns, visit Boston for the same, not only losing his time in the field, but having the additional expense of car fares. This has been practically eliminated; also, the local dealers did not always carry in stock such supplies as were needed, and long delays were occasioned. This very rarely happens under the new system.

Method of Ordering Supplies.

The local superintendent of each town is furnished with a catalogue, also with duplicate order blanks. He makes out orders and forwards them to the agent or division superintendent in charge of his district, for his approval. The agent then forwards the order to the supply store, where it receives immediate attention. The improvement in the equipment in the field is very noticeable, particularly in the increased use of hand carts. There are five times as many in the field as a year ago, making a large saving in horse hire, this having been a large item in the past. It has been our aim to furnish first-class material, and whenever supplies have not been satisfactory, the matter has been investigated at once, and such things as were needed have been procured. The saving which has been made in the new system has enabled us to do more work in towns which are being reimbursed. Another feature of the supply store is that it has been used for repairing motor cycles, where a considerable saving has been made, approximately $33\frac{1}{2}$ per cent. We have several mechanics employed in assembling power sprayers and repairing sprayers in the field. This has proved very helpful and very economical. Nearly all of the power outfits in towns will be overhauled this winter by these men, that they may be in readiness for work when needed next season. A large per cent. of saving will be made next season, owing to this year's experience, as we have been able to discover several ways where money may be saved. We hope that whenever the town or city officials have suggestions to make, they will make them to this office at once, that we may consider them and see if they may be of use to us. When tools or supplies are not satisfactory, the fact should be brought to the attention of this office at once. In making out orders, it is hoped that local superintendents will be careful not to make mistakes, as the inconvenience is not only to them in the field work, but also to the supply store. The following is the list of supplies carried in our supply store. These supplies are furnished to towns receiving reimbursement only, nothing being sold to other towns or cities, or to the general public.

LIST OF SUPPLIES BY NUMBER.

No.

1. Arsenate of lead, 600 lb. barrel.
2. Arsenate of lead, 100 lb. kegs.
3. Axes, handled, 31" handle, 3¼ lb.
4. Axes, with handle, 31" handle, 3½ lb.
5. Axes, with handle, 31" handle, 3¾ lb.
6. Axe handles, Hopkins, oak 31".
7. Axe wedges, malleable iron.
8. Bolts for Waters pruners.
9. Brushes, extra, for poles.
10. Brushes, hand.
Brushes, wire, for crushing caterpillars:—
11. No. 1 Brophy improved.
12. No. 2 Lexington.
13. No. 3 Stoneham.
14. No. 4 Fells.
15. No. 5 Brophy.
16. No. 6 McCullough.
17. No. 7 Reading.
18. Brushes, pole, 12'.
19. Brushes, pole, 16'.
20. Burlap, 8".
21. Burlap, 10".
22. Bush hook handles, hickory, 32".
23. Bush hooks, handled.
24. Bush scythes, heavy.
25. Bush scythe loops and nuts.
26. Bush scythe snaths, heavy.
27. Bush scythe wrenches.
28. Cans, ¼ pt., twin brush.
29. Cans, pint, brush.
30. Cans, varnish (nozzle top), 1 gal.
31. Cans, oil, 1 gal.
32. Cans, gasoline, 5 gals.
33. Cans, creosote, 5 gals.
34. Cement.
35. Chains, 6' stake.
36. Chisels, heavy, 1½" socket firmer, plain edge.
37. Chisel handles, extra.
38. Climbing irons, Dicky, 16".
39. Climbing irons, Donnelly, 16".
40. Climbing irons, Lineman, 16".
41. Climbing iron pads.
42. Climbing iron plugs and rivets.
43. Climbing iron straps with buckles.
44. Coal tar.
45. Cotton waste.
46. Cork stoppers for pint cans.
47. Coupling, full-way, for 1" hose.
48. Coupling, long-tailed, for ½" hose.
49. Coupling, long-tailed, for ¾" hose.
50. Coupling, long-tailed, for 1" hose.
51. Coupling, long-tailed, for 1½" hose.
52. Creosote.
53. Dry batteries, small, No. 6.

No.

54. Dry batteries, large, No. 7.
55. Dry batteries, special, No. 8.
56. Emery cloth, fine.
57. Faucets, ¾" cast iron.
58. Faucets, 1" cast iron.
59. Ferrules for Clyde pruners.
60. Files, 3-cornered 6" slim taper.
61. Files, flat 8".
62. Fork handles, for manure fork No. 44.
63. Forks, long-handled manure, No. 44.
64. Gas, carbonic, for gas sprayers, in 50-lb tubes.
65. Gasolene.
66. Gauges, pressure.
67. Gas, carbonic, for gas sprayers, in 20-lb. tubes.
68. Glasses, extra, for mirrors.
69. Gouges, 1½" socket firmer.
70. Grease, axle.
71. Grease, hard, for pump cups.
72. Grindstones, bi-treadle, ball-bearing.
73. Grindstone, extra.
74. Hammers, No. 12, Maydole.
75. Handcarts, 44 x 30.
76. Hatchets, lathing.
77. Hatchets, 1 lb. axe-shaped.
78. Hose, ½" cotton hose.
79. Hose, ¾" cotton hose.
80. Hose, 2½" cotton, for hydrant.
81. Hose, 2½" suction hose.
82. Hose, 1" 7-ply rubber imitation marline covered.
83. Hose, 1½" 4-ply imitation marline covered.
84. Hose, ¾" oil.
85. Hose reducers, 1½" x 1".
86. Hose reducers, 1" x ½".
87. Hose spanners.
88. Hose menders, ¾".
89. Hose connection, ½" Y.
90. Hydrant gates.
91. Jute twine for burlapping.
92. Knife screws for Waters pruners.
93. Knives, burlap.
94. Knives, cleaning.
95. Knives, sailors, sheath and belt.
96. Knives for telegraph pruners.
97. Knives for Waters pruners.
98. Ladders, extension, 20'.
99. Ladders, extension, 22'.
100. Ladders, extension, 24'.
101. Ladders, extension, 28'.
102. Ladders, extension, 34'.
103. Ladders, extension, 38'.
104. Ladders, extension, 40'.
105. Ladders, straight, 10'.
106. Ladders, straight, 12'.

LIST OF SUPPLIES BY NUMBER — *Continued.*

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| <p>No.</p> <p>107. Ladders, straight, 15'.</p> <p>108. Loops, extra, for 3' 1-man cross-cut saw.</p> <p>109. Mallets, hickory, ½ lb.</p> <p>110. Marline No. 8.</p> <p>111. Mirrors, 2 x 4, with handle.</p> <p>112. Nails ¾" barbed roofing.</p> <p>113. Nozzles, single vermored.</p> <p>114. Nozzles, duplex vermored.</p> <p>115. Nozzles, triplex vermored.</p> <p>116. Nozzles, Bordeaux.</p> <p>117. Nozzles, 6', for woodland work.</p> <p>118. Nozzles, hose pipe screw, 10''.</p> <p>119. Nozzles, hose pipe screw, 15''.</p> <p>120. Nozzles to fit 1" hose, 15" long.</p> <p>121. Nozzles to fit 1½" hose, 18" long.</p> <p>122. Nozzle tip, ¼''.</p> <p>123. Nozzle tip, ⅜''.</p> <p>124. Nozzle tip, ½''.</p> <p>125. Oil-burning outfit.</p> <p>126. Oil, burning.</p> <p>127. Oil, cylinder.</p> <p>128. Opera glasses.</p> <p>129. Padlocks, 2" Yale, No. 853.</p> <p>130. Pails, heavy galvanized iron, 14 qt.</p> <p>131. Pails, creosote.</p> <p>132. Paint, white.</p> <p>133. Pitchforks, 4-tine.</p> <p>134. Pliers, Barnard side-cut, 7½''.</p> <p>135. Poles, bamboo, 12'.</p> <p>136. Poles, bamboo, 16'.</p> <p>137. Poles, spruce, for telegraph pruners, 18'.</p> <p>138. Poles, spruce, for telegraph pruners, 20'.</p> <p>139. Poles, spruce, for telegraph pruners, 24'.</p> <p>140. Poles, window brush.</p> <p>141. Pruners, No. 2 Clyde.</p> <p>142. Pruners, extra handles for No. 2 Clyde.</p> <p>143. Pruners, telegraph, with pole, 18'.</p> <p>144. Pruners, telegraph, with pole, 20'.</p> <p>145. Pruners, telegraph, with pole, 24'.</p> <p>146. Pruners, telegraph, without pole.</p> <p>147. Pruners, Waters, with spring for removing brown-tail webs, 12'.</p> <p>148. Pruners, Waters, with spring for removing brown-tail webs, 14'.</p> <p>149. Pruners, Waters, with spring for removing brown-tail webs, 16'.</p> <p>150. Pruning shears.</p> <p>151. Pump packing; designate pump.</p> <p>152. Rakes, fire, long steel shank, 14 tooth.</p> <p>153. Rope, Manila, for extension ladders.</p> <p>154. Rope, Manila, 1''.</p> <p>155. Rope, Manila, 1½''.</p> | <p>No.</p> <p>156. Rope, Manila, for telegraph pruners.</p> <p>157. Rope, cotton sash.</p> <p>158. Rubber packing for face plates on Douglas pump; give size.</p> <p>159. Rubber valve seats for pump; designate pump.</p> <p>160. Saws, Disston, 3' 1-man cross-cut, Great American Tooth.</p> <p>161. Saws, Disston, 26" No. 7, 5-point.</p> <p>162. Saws, 5' 2-man cross-cut.</p> <p>163. Saws, 6' 2-man cross-cut.</p> <p>164. Saw handles for No. 7, 26" 5-point Disston.</p> <p>165. Saw handles for 3' 1-man Disston.</p> <p>166. Saw handles for 6' 2-man cross-cut saw.</p> <p>167. Scales for weighing arsenate of lead.</p> <p>168. Scraper's barbox.</p> <p>169. Screw eyes for telegraph pruners.</p> <p>170. Screw drivers, 6''.</p> <p>171. Scythe stone, Norton emery.</p> <p>172. Snips, tinning.</p> <p>173. Shovels, long handled, round point.</p> <p>174. Shovels, square end (fire shovels).</p> <p>175. Spark plugs.</p> <p>176. Sprayer-barrel outfit.</p> <p>177. Sprayer, double-acting pump and tank.</p> <p>178. Spray poles, ½" galvanized 8' iron, fitted.</p> <p>179. Springs, extra, for Waters pruners.</p> <p>180. Springs for telegraph pruners.</p> <p>181. Strainers for 1½" suction hose.</p> <p>182. Strainers, for 2" suction hose.</p> <p>183. Strainers, for 2½" suction hose.</p> <p>184. Tanglefoot, 25 lb. tins.</p> <p>185. Tanglefoot, 40 lb. wooden pail.</p> <p>186. Tanglefoot, ½ barrel.</p> <p>187. Tanglefoot combs.</p> <p>188. Tape, electric, ¼ lb. roll.</p> <p>189. Tape, electric, ½ lb. roll.</p> <p>190. Trowels, 7½" brick.</p> <p>191. Trowels, pointing 5''.</p> <p>192. Washers, for 1" suction hose.</p> <p>193. Washers, for 1½" suction hose.</p> <p>194. Washers, for 2" suction hose.</p> <p>195. Washers, for 2½" suction hose.</p> <p>196. Washers, for 1½" hose.</p> <p>197. Washers, for 1" 7-ply marline-covered hose (for new coupling).</p> <p>198. Washers, for 1" 7-ply marline-covered hose (for old coupling).</p> <p>199. Washers, for 1½" 7-ply marline-covered hose (for old coupling).</p> <p>200. Washers, for ½" cotton or rubber hose.</p> <p>201. Washers, for ¾" cotton or rubber hose.</p> |
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LIST OF SUPPLIES BY NUMBER — *Concluded.*

No.	No.
202. Wedges, steel, 4½ lb. Truckee.	217. Fourth Annual Report of Superintendent for Suppression of Gypsy and Brown-tail Moths.
203. Wrenches, bicycle, 8".	218. Bulletin No. 2.
204. Wrenches, monkey, 12".	219. Sixth Annual Report of State Forester.
205. Wrenches, Stillson, 14".	220. How to make Improvement Thinnings.
206. Zinc, sheet, 9 oz.	221. Reforestation in Massachusetts.
207. Memorandum books.	222. Massachusetts Wood-using Industries.
208. Monthly report sheets.	223. We must stop Forest Fires.
209. Pay roll blanks.	224. Forest Mensuration of the White Pine.
210. Record books.	225. How and when to collect White Pine Seed.
211. Schedule of bill blanks.	226. Forestry in Massachusetts.
212. Time books.	227. Forest Laws.
213. Triplicate books.	228. Parasite Bulletin.
214. First Annual Report of Superintendent for Suppression of Gypsy and Brown-tail Moths.	
215. Second Annual Report of Superintendent for Suppression of Gypsy and Brown-tail Moths.	
216. Third Annual Report of Superintendent for Suppression of Gypsy and Brown-tail Moths.	

SUPPLEMENTARY LIST, OCT. 19, 1910.

No.	No.
229. Axes, broad.	246. Hose menders, ½", ¾", 1".
230. Axes, hand.	247. Ladder, slip (made by Moulton).
231. Battery connections.	248. Oilers, copper, for machinery.
232. Beetles (state size).	249. Packing, flax.
233. Blade holders for bush scythes.	250. Packing, Selden's.
234. Bramble scythes.	251. Saw clamps with 1" jaw.
235. Chisels, ¾" flat.	252. Saws, two-edge pruning.
236. Chisels, 2".	253. Scrapers, 3-cornered.
237. Clyde pruner No. 2 bolts.	254. Strainers for lead.
238. Clyde pruner No. 2 rivets.	255. Switch keys.
239. Copper wire on spool.	256. Tinning snips, curved blades.
240. Gage glasses.	257. Tunnels, small.
241. Gaskets, copper.	258. Waters pruner handles, extra.
242. Gasoline tunnel with strainer.	259. Wrenches, monkey, 24".
243. Gouges.	260. Wrenches, Stillson, 18".
244. Handles, extra, for bush scythes.	261. Wrenches, Stillson, 24".
245. Hose mender bands, ½", ¾", 1".	

CO-OPERATION.

Co-operation between this office and cities, towns and property owners is greatly to be desired, and is encouraged by this office. In cities already heavily burdened with expenses there are often public parks badly infested, where some co-operative arrangements might be made with this office, so that the expense of the work may be lightened for the city. It would be necessary to confine such arrangements to places most used by the public. This might also be done in large towns having public parks.

The problem of the individual is somewhat different, as troubles are usually confined to their own estates or to adjoining ones; but in either case, if the property owner shows a disposition to care for his estate in the proper manner, and he is the owner of valuable wooded areas, oftentimes better results can be accomplished by making some co-operative arrangement with this office. In cases where valuable woodlands are badly infested, the work of cleaning them should not be delayed too long, as each year they will depreciate in value, making the work more expensive. It must also be borne in mind that thinning, where there is not too much dead wood, oftentimes will nearly pay for itself in the cord wood that is removed, and also give the remaining growth a much better chance to mature. Where individuals clean their own property, and adjoining lands are badly infested, and the owner is unable to care for such parts as may border on his neighbor's lands, some co-operative plan should be arranged to meet the case. In spraying, it is also a benefit to have spraying apparatus used in cities and towns for the moth work and elm-leaf beetle work. We are willing to co-operate in any of the above-named ways; but cases should be brought to the attention of this office at the beginning of the year, so that there may be sufficient time to plan the work.

In purchasing extra spraying outfits which may be used in the future in spraying for the elm-leaf beetle, as well as in the work against gypsy moths, we are willing to co-operate with towns or cities.

This co-operative work is of value not only to the individual, but also to the community at large and therefore to the Commonwealth.

NATIONAL AID.

The work done by the federal forces during the year 1910 has been very commendable. The roadside thinning, which has been done by them this season in cities and towns where the infestation was severe enough to cause stripping of trees and dropping of caterpillars, has been a great help. Since the thinning and cleaning have been confined to a 50-foot strip, a greater number of miles have been covered than in previous years; and before another caterpillar season such roadsides as can properly

be treated by them will be nearly covered. We do not wish it understood that no more aid along this line will be needed; but the point that must be considered is, if this kind of work is nearly completed, what is the next most necessary step. It is generally understood by those best qualified to judge that national aid must be rendered us, with more definite purpose and by methods surer of results than ever before. According to the amount of infestation at the present time, Massachusetts is receiving less in proportion than any other State which is infested with the gypsy and brown-tail moths. Massachusetts' appropriation is \$300,000; the cities and towns spend \$350,000 and the tax which property owners pay amounts to from \$150,000 to \$200,000, making a possible expenditure of \$850,000, not including what is being appropriated and expended in State parks and on the lands of State institutions, which would amount to nearly \$200,000 more, this making an expenditure which can be estimated of \$1,000,000 in all against the moths in the State. There is also a very large amount expended each year by individuals, of which there can be no record obtained, which shows that the government expenditure for New England in the fight against the gypsy and brown-tail moths, which is \$300,000, is about one third of what Massachusetts is expending; and, as there are three other New England States with serious infestations of the gypsy moth, Massachusetts gets but a small part from the government, compared with what it should get. A tabulation of the expenditure of this money, which follows, reveals the exact condition. Maine expenditure from 1905 to January, 1910, \$95,000; government, \$50,000; New Hampshire, \$37,000; government, \$90,000; Rhode Island, \$33,000; government, \$38,000; Massachusetts, from May, 1905, to January, 1910, \$5,500,000; government, \$417,763.84.

After considering this analysis of moth expenditure in the New England States which are infested with the gypsy moth, it does not seem that Massachusetts, with its long, hard fight against this pest, and with its enormous expenditure, is getting its share of assistance from the government funds: that is, if the question of proportionate expenditure be taken into consideration. This work, from the time of starting in 1906, has been carried on with the purpose of controlling the spread of

the gypsy moth by the method of thinning wooded roadsides where bad infestations were found, and caring for the same throughout the year. This method seems to be the best up to the present; and, as before mentioned, probably before another caterpillar season a greater part of this work will be covered in this State. As it has also been determined that the spread of the gypsy moth is not alone brought about by artificial means (as is explained in another part of this report), some other means of assistance is due this Commonwealth. In other States, when the appropriation has been exhausted, the State forces have been taken on to the government pay roll and the work continued along the same lines. It often happens in our Massachusetts work that there is not sufficient money to carry out what might be termed necessary work; and when our funds are exhausted, there are no means for continuing until another appropriation from the State is available. This handicaps our work badly; and if we are obliged to allow men to lie idle any length of time, they immediately secure employment with the government forces, and when our money for the work is available it is necessary to take untrained men, which is a loss in efficiency and expense. It therefore seems to us that some more definite plan should be made, so that we should receive our proportionate share of the federal appropriation. Although our infested territory is not growing much larger, it is becoming more badly infested in the northern section of the State, as the gypsy moth is inclined to spread in this direction, thus necessitating larger expenditures by the State in this section; and, as the residential section in most cases is in much better shape, more attention is being paid to the infested woodland by the owners, and co-operation is asked for. With the limited appropriations which our State is able to make, this becomes a very severe hardship financially, and in these cases help from the government funds is needed. In order to supply the demand for help along this line, larger government appropriations should be made, with the stipulation that part of the money should be spent in this co-operative work with the State. Another reason why larger government appropriations are needed is, that inspection of shipments of all kinds is required to prevent the spread of the gypsy moth; and, as this problem is one

of great magnitude, if done on a large scale it will necessitate a large expense in itself. To result satisfactorily, it must be done in a very thorough manner.

On examining the analysis of expense, it will be seen that the other States are receiving larger sums in comparison to their expenditure than Massachusetts; and when the question is raised as to why this is done, the argument is used that their valuation will not allow them to make sufficient appropriation to carry on the work. Let us take our own case and look into it thoroughly, and see if we are not in the same class as the others, or worse. For twelve years previous to 1900 the State continued to appropriate money for this work. It was then stopped and taken up again four and one-half years later with larger appropriations than ever, and at that time a law was enacted so that the burden of expense was placed on the Commonwealth, cities, towns and property owners. They have stood the financial strain in an uncomplaining manner, while in other States, cities, towns and property owners are not suffering from this burden to any extent. As the law in our Commonwealth allows only a small moth tax to be placed on valuable wooded areas that promise to be ruined unless given treatment, it seems that the expense of this work should be shared by the government. As the cities, towns and State can do only a very small part of this work, to our minds this problem is becoming more and more of national consequence. Taking the badly infested sections into consideration, the westward border of our infested district is one of great importance, not only for this State, but to the whole country; and as time goes on, and the infestation increases in this section, the more the country west of us is threatened. If this pest ever passes the Connecticut River in our State, the States west of us are sure to become infested in time, and then the possibilities of control are almost beyond reason; while at the present time, if the proper methods are used, the chance of this westward spread is very small. While this Commonwealth is compelled to act under the present statute, it is powerless, as we cannot employ trained men and do the work as it should be done, as each town is doing its own work with what might be termed "untrained" men. On the other hand, if sufficient government funds were available, this

district could be thoroughly handled in the proper manner. It is therefore self-evident to one who understands the problem that the government appropriations are only one-third large enough; and it should be the duty of the people of our State and adjoining States to make an appeal to Congress for sufficient money to do enough work for more effective protection.

NORTH SHORE WORK.

The work on the famous North Shore has been continued throughout the year. It is certainly fortunate for this section of the State that it contains such a public-spirited class of people.

The towns and cities represent one party and the North Shore fund raised by private subscription another, while the State is a third party. By all three interests uniting and having the work under the State's jurisdiction, we are able to accomplish exceptionally fine results. This North Shore work has proven especially valuable as an object lesson in demonstrating what can be accomplished.

The following is a partial reproduction of the summer residents committees' report:—

GYPSY MOTH AND ROAD WORK ON THE NORTH SHORE.

General Purposes.

This circular is sent to outline the work which has been done on the North Shore during the last year, to preserve the forests and beautiful wooded drives and places, to develop its beauties by building wood roads, to keep the roads already built in repair, and to prevent the dust nuisance by oiling the roads.

It is sent to the subscribers so that they may know what has been accomplished and where and how their money was spent.

It is sent to the residents on the shore who have not subscribed, not only to show them what has been done to preserve its beauties and add to their pleasure, at the expense of the subscribers, but, even more, to give them an opportunity to co-operate by subscribing their fair share of the cost of the work.

Preserving the Forest.

Your committees present herewith a map showing the woodland on the North Shore which has been cleared, the brush burned, the nests creosoted and the territory sprayed during the past season. You will



EXPLANATION

TREATED WITH CREOSOTE.

UNCUT.

CUT IN 1910.

CUT IN 1909.

CUT IN 1908.

COLONIES SPRAYED.

LAKES AND PONDS.

STEAM R.R.

CARRIAGE ROADS.

WOOD ROADS.

BROOKS.

TOWN AND CITY LINES.

1910

CHARACTER OF WORK	ACRES	COST	UNIT COST
Spraying	3015 1/2	\$19,651.41	\$ 6.51 per acre
Tanglefooting		1,324.27	
Creosoting		6,908.33	2.17 1/2 per acre
Cutting and burning	925 1/2	20,801.31	22.48 per acre
Road building		451.31	.03 1/2 per sq. yd.

PLAN SHOWING NORTH SHORE GYPSY MOTH COLONIES TREATED BY STATE SUPERINTENDENT. AUGUST - 1910

MANCHESTER COMMITTEE
MAJ. HENRY L. HIGGINSON.
GARDNER M. LANE.
GEORGE WIGGLESWORTH.

BEVERLY COMMITTEE.
OLIVER AMES.
CHARLES H. TYLER.
WM. D. SOHIER.

notice that, more than ever before, the work has been circumscribed and confined to the woodland adjoining the shore and the sides of the wood roads. This was due to the fact that it was evidently an impossible task to take care of all the back woods.

The woods adjoining the shore from Magnolia to Gloucester were being rapidly destroyed, and your committee therefore took up, with the city of Gloucester and the residents in that neighborhood, the question of caring for those woods, in addition to the territory already cared for in Beverly and Manchester.

The result was that the city of Gloucester subscribed \$2,500, the State agreed to contribute \$2,500 and to superintend and direct the work, and the residents in that immediate neighborhood subscribed \$2,535. Consequently, 305 acres in that vicinity were cared for and sprayed.

How the Work was done.

In order to give an idea of how the work was done and the plant that was necessary to accomplish it, as well as the work which was accomplished, we present herewith some half-tones that illustrate it more graphically than words can.

The first one shows the spraying machines used on the North Shore work and the auxiliary equipment, like the three gasoline pumps, the water carts that were used as tenders, the hose, etc. To do economical work it is necessary to have a gang of about eleven men with each spraying machine and about 1,000 feet of hose. In this manner a large radius is covered from the source of supply. The gasoline pumps also decreased the cost by pumping the water 1,000 feet or so.

The whole problem of economical spraying depends upon the rapidity with which the tank can be filled and emptied and the number of times this can be done during the day. Some of our new machines this year covered as much as 24 acres a day, which means that the tank was loaded and unloaded twenty-four times.

In the next two cuts we show the spray being thrown on to and in fact over the trees. Great economy was effected this year by the use of a nozzle gotten out by L. H. Worthley, superintendent, which was very easy to handle, and from which a spray could be thrown over all of the trees in the forest without climbing. This proved a great saving in time and money.

Another cut shows a cluster of gypsy moth caterpillars attempting to climb a tree which has been tanglefooted, and there are two more cuts which illustrate the value of the work which has been done upon the roadsides. These show the trees defoliated early in the season in the back woods where no spraying was done, and the trees upon the roadside which have been sprayed, their leaves being intact.

A cut is also given of Mussell Point in Gloucester, near the life-saving station, which shows graphically the importance of the work done and

what can be done. Last year there was not a single leaf left on the trees, and the ground was absolutely covered by the crawling caterpillars. This work was taken on this year in connection with the Gloucester work, the forest was cleared up, the nests creosoted and the territory sprayed, the result being that the trees were unharmed.

Another illustration of the same character would be found on the hill belonging to Mr. Cabot, directly back of the Essex County Golf Club links. This hill was thoroughly defoliated last year, the caterpillars crawling over the golf links and greens. There was very little stripping there this year, if any, in consequence of the work done.

The Work accomplished.

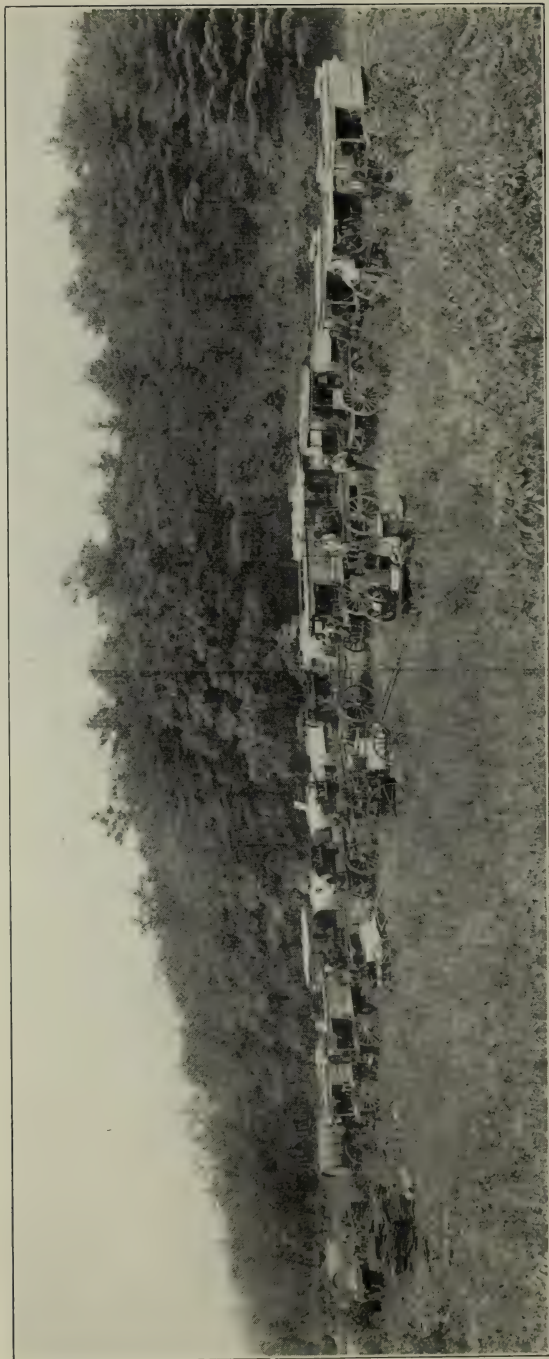
Roughly speaking, about 1,000 acres of woodland were cleared up and sprayed in 1908, about 2,100 acres in 1909 and something over 3,000 acres in 1910. The cost of the work is interesting, being approximately as follows: in 1908, \$60,000; in 1909, \$60,000; in 1910, nearly \$57,000; the acreage covered in 1910 being about three times that cared for in 1908, and the total expenditure being somewhat smaller.

The work has all been done under the direction of the State forestry department, of which Mr. F. W. Rane is the head, but it has been directly in charge of his gypsy moth superintendent, Mr. L. Howard Worthley, who has under him two extremely efficient assistants in charge of the work on the ground, Messrs. Saul Phillips and Walter F. Holmes. All of these gentlemen are entitled to the greatest possible credit for their efficient work, but for which there would have been but few trees left unstripped in the Beverly and Manchester woods. In fact, there seems no doubt that the conditions would now be unbearable had the colonies been allowed to spread during the last few years.

Our Woods can be preserved.

It seems to your committee that the work which has been done absolutely demonstrates, beyond a doubt, that thorough and efficient work will preserve the woods, and this at a constantly decreasing cost per acre. You have all seen territory which was defoliated in 1909, and which is practically untouched in 1910. The conditions in the woods where work has been done are better each year, the gypsy moths are fewer, and fewer trees are being defoliated. In spite of this, the cost has been lessened.

In consequence of the efficient work on the part of the State superintendent this year, many economies have been effected, and it is hoped that much improvement may be made along this line next year. The introduction of better spraying machines is a great saving. Two new spraying machines, which were built at no greater cost than the old ones, have nearly, if not quite, double the capacity. They can spray twice as many acres in one day with the same labor force.



Spraying plant used in 1910.

How the Money was secured.

This year, as in former years, the Governor of the Commonwealth was appealed to for help. It was agreed by Governor Draper that the State gypsy moth department should take charge of the work, and that for the first money necessary, the State, the city of Beverly and the town of Manchester, and your committee, should share the expense, each paying one-third. Your committee therefore saw the officials of the city of Beverly and secured the sum of \$5,000; Manchester, at a town meeting, appropriated \$7,500; the State contributed \$12,500; the committee contributed \$12,500; making a total amount available for the work of \$37,500. The balance of the expense was shared by the Commonwealth and your committees. Had it not been for the generous and hearty co-operation of the Commonwealth of Massachusetts, it would have been impossible to preserve the roads on the North Shore.

The United States Authorities co-operate.

Early in the season it was arranged with the United States authorities, through Mr. Dexter M. Rogers, who was in charge of the work in our district, that they would, from their available funds, clear out and care for the woods 100 feet wide on each side of some of the main roads, in addition to roads which they have cared for in former years, this being in line with their regular work, which is invariably in the nature of a quarantine, to prevent the caterpillars from being spread. The United States authorities therefore cleared up and creosoted the nests upon the sides of 25 miles of wood roads, or about 600 acres, spending approximately \$14,500 in connection with this work. They refused, however, to take care of the woods upon the sides of the wood roads from which automobiles were excluded, on the ground that because of the exclusion of automobiles there was less danger of the gypsy moth caterpillars being carried long distances. They did, however, take care of the New Manchester Water Works Road through to Chebacco, and Hesperus Avenue in Magnolia, because automobiles were allowed to use those roads. We feel that all of our residents are indebted to the United States authorities, especially Dr. Howard and Mr. Rogers, under whose direction the work was done.

Your committee, therefore, had to take care of the roadsides on the 28 miles of wood road which are maintained by private subscription.

The same committee that served last year, Maj. Henry L. Higginson, Gardiner M. Lane and George Wigglesworth, solicited and secured subscriptions amounting to over \$10,000 from the summer residents in Manchester.

Your Beverly committee secured something over \$15,000 from the summer residents in Beverly, and also obtained \$2,500 from the city of Gloucester, \$2,500 from the State, as well as something over \$2,500

which was subscribed by residents in that neighborhood. This enabled the committee to care for some of the woods near the water from Magnolia Point to Gloucester.

Cost of the Work.

According to the report of the State superintendent, the work this year was as follows:—

In Gloucester, 202 acres cleared, burned and creosoted, 305 acres sprayed, at a total cost of \$7,642.82.

In Beverly, Manchester and adjoining woods, 925 acres cut, burned and many of them creosoted, 3,015 acres sprayed, etc., at a total cost of \$49,137.13, not including plant and some materials.

EXPENDITURES.

Expenditures from Aug. 1, 1909, to July 16, 1910,	\$43,044 63
Tools, spraying machines, etc.,	14,160 39
Bills outstanding,	937 18
	<hr/>
	\$58,142 20
Value of tools and supplies on hand,	9,005 07
	<hr/>
Actual cost of work, not including plant,	\$49,137 13

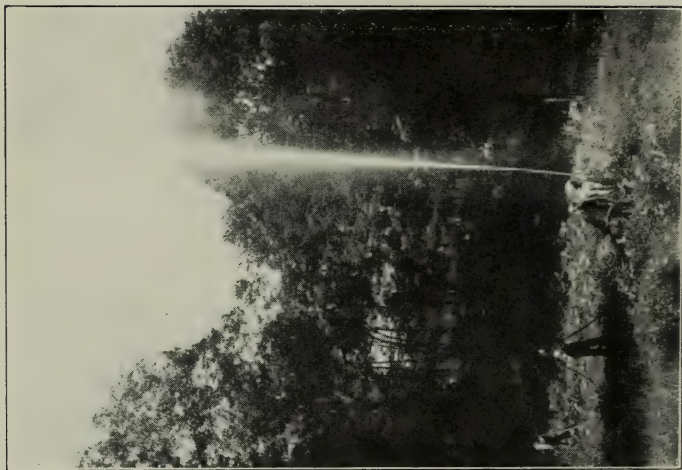
Details of Cost of Work.

Spraying,	\$19,651 41
Tanglefooting,	1,163 02
Combing tanglefoot,	161 35
Road building,	451 31
Cutting and burning,	20,801 31
Creosoting in Adams estate,	420 47
Creosoting in Bradley estate,	49 82
Creosoting in Walker's estate,	1,012 09
Creosoting, general,	5,426 35
	<hr/>
	\$49,137 13

Average Cost of Work.

Spraying, per acre,	\$6 51 ² / ₇
Creosoting, per acre,	2 17 ³ / ₄
Cutting and burning, per acre,	22 48 ⁷ / ₉
Road building, per square yard,	031 ¹ / ₇
Cost of running one sprayer, per day,	66 16

Where the work was done on private estates, which was only in the back woods, where it came in connection with other work that your committee was doing, the money is being repaid by the owners when they are able to do so.



Spraying machines at work, showing new nozzle.

Parasites.

Many thousands of parasites have been planted in various localities in our back woods, where it was not likely that they would be interfered with by spraying, next year. Many varieties of parasites have been cultivated in this country, and so far have survived our winters, and several of them promise satisfactory results. Several of the most promising varieties have been imported in vast numbers from Japan and from Europe, and many of these have been liberated upon the North Shore. This work has been under the charge of the United States Department of Agriculture, and under the direction of its expert, Dr. L. O. Howard.

Plantings have been made, not only of the *Calosoma* beetle, a small green beetle, but also of several varieties of flies and smaller insects, which attack the gypsy moth in its various stages of development. Naturally, it will be several years before these parasites can develop enough to secure the balance of power, because the gypsy moths are already present in such large numbers. All the best experts agree, however, that in a few years the parasite will develop and secure the balance of power in this country, as it has already done in all other countries where the gypsy moth is prevalent. In the meantime, we must preserve all our most valuable woodland near the shore by active, efficient and co-operative work.

Dr. Howard told your secretary last winter that, while he should not feel justified officially in giving an absolute statement to that effect, he personally had very little doubt that within three or four years the parasites would develop sufficiently to obtain the balance of power over the gypsy moth caterpillars.

Another encouraging feature this year was that in some of the large colonies the wilt disease, so called, developed and attacked both brown-tail and gypsy moth caterpillars, killing them off in large numbers. One piece of woods in particular is interesting in this respect, that being the large section near Magnolia and West Gloucester, bounded by Magnolia Avenue, the State highway at Gloucester and Essex Street, which runs from the West Gloucester station toward Gloucester. Last year it was absolutely swarming with caterpillars, and there was hardly a leaf left. Your committee put three spraying machines at work there, and prevented the caterpillars from spreading by spraying some 300 feet in on the borders. This starved out a great many caterpillars, and this year the wilt disease killed many more, and consequently many of the trees in that section of woods, while they have not been sprayed, still have their leaves in fairly good condition. This is true also in other places, in the Chebacco woods and elsewhere, and is an extremely hopeful sign for the future.

Our Hopes for the Future.

Your committee believes that if the money is provided and the work continued on the lines on which it has been begun, our beautiful woods adjoining the shore can be preserved, as can also the woods immediately adjoining the wood roads.

It hopes that the subscribers and the cities and towns, as well as the United States and State governments, will co-operate in the future, as they have in the past.

It hopes that every resident or summer resident on the North Shore who has enjoyed our woods, our drives and our dustless roads, and who has not yet subscribed, or who has not yet given his fair share towards this work, will co-operate by sending a check to Wm. D. Sohier, agent, 15 Ashburton Place, Boston, Mass.

A list of the subscribers is published herewith.

WM. D. SOHIER,
For the Committee.

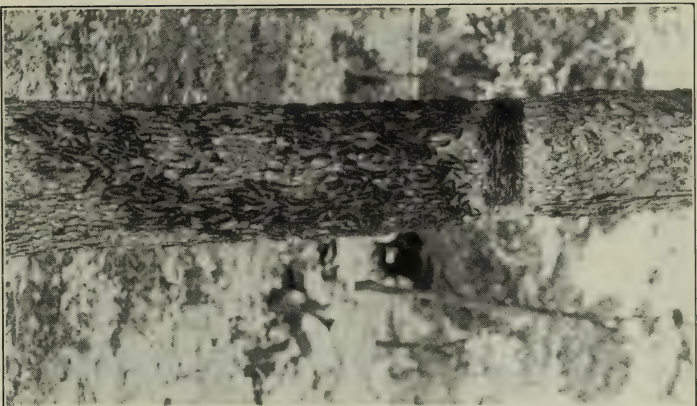
SUMMER RESIDENTS COMMITTEES.

<i>Beverly.</i>	<i>Manchester.</i>
Oliver Ames.	Maj. Henry L. Higginson.
Charles H. Tyler.	Gardiner M. Lane.
William D. Sohier.	George Wigglesworth.

SUBSCRIPTIONS FOR GYPSY MOTH WORK ON THE NORTH SHORE, 1910.

<i>Beverly.</i>		
Henry C. Frick, . . .	\$2,000	Robert S. Bradley, . . . \$250
William H. Moore, . . .	1,000	J. L. Saltonstall, . . . 250
W. S. & J. T. Spaulding, . . .	750	William Endicott, Jr., . . . ¹ 250
Oliver Ames, . . .	500	Dr. Henry F. Sears, . . . ¹ 250
Mrs. R. D. Evans, . . .	¹ 500	Robert Saltonstall, . . . 250
William Endicott, . . .	500	Bryce J. Allan, . . . 250
Mrs. Charles H. Dalton, . . .	400	Frederick Ayer, . . . 250
D. Herbert Hostetter, . . .	300	F. L. Higginson, . . . 250
Dudley L. Pickman, . . .	¹ 300	Hon. William C. Loring, . . . 250
John T. Morse, Jr., . . .	300	Herbert M. Sears, . . . 250
Col. C. N. Wallace, . . .	¹ 300	Alexander Cochrane, . . . 250
W. B. Thomas, . . .	250	Henry P. King, . . . 200
Quincy A. Shaw estate, . . .	250	Thomas P. Rea, . . . ¹ 200
Amory A. Lawrence, . . .	250	The Misses Loring, . . . 200
Miss Fanny P. Mason, . . .	250	Mr. and Mrs. Neal Rantoul, . . . 200
George S. Mandell, . . .	250	Cora H. Shaw, . . . 200
William Phillips, . . .	250	Mrs. Nicholas Longworth, . . . 200
Charles H. Tweed, . . .	250	Philip S. Sears, . . . 150
Charles H. Tyler, . . .	250	Mrs. J. B. Silsbee, . . . 150
George Dexter, . . .	250	F. J. and Alice Cotting, . . . 125

¹ Available for either moth or road work.



Tanglefoot, — eypsy moth caterpillars
underneath.



Wood road, — trees sprayed on roadside, stripped
inside where they were not sprayed.

SUBSCRIPTIONS FOR GYPSY MOTH WORK, ETC.—*Continued.**Beverly — Concluded.*

Allen Curtis, . . .	\$100	George A. Goddard, . . .	\$100
Amos Lawrence, . . .	100	F. I. Amory, . . .	50
Leonard Ahl, . . .	100	Gordon Dexter, . . .	50
Charles Storrow, . . .	100	T. C. Hollander, . . .	50
Col. C. L. Pierson, . . .	100	Dr. Franklin Dexter, . . .	50
Mrs. Guy Norman, . . .	100	James L. Paine, . . .	50
A. Shuman, . . .	100	Mrs. John S. Curtis, . . .	50
Charles J. Morse, . . .	100	Mrs. Franklin Haven, . . .	50
Mrs. John C. Phillips, . . .	100	Mrs. F. H. Peabody, . . .	50
Mrs. James F. Curtis, . . .	100	Mrs. Robert C. Heaton, . . .	¹ 50
Augustus P. Loring, . . .	100	Mrs. Hall Curtis, . . .	50
The Misses Paine, . . .	100	Norman F. Greeley, . . .	25
Mrs. E. Preble Motley, . . .	100	A. C. Ratschesky, . . .	25
Harold J. Coolidge, . . .	100	Charles K. Cummings, . . .	25
Horace D. Chapin, . . .	100		
Mrs. Samuel T. Morse, . . .	100	Total, . . .	\$15,850
Katharine E. Silsbee, . . .	¹ 100		

Manchester.

George R. White, . . .	¹ \$500	Mrs. S. P. Blake, . . .	\$100
Charles E. Cotting, . . .	500	Roland C. Lincoln, . . .	100
Lester Leland, . . .	500	Ezra C. Fitch, . . .	100
George N. Black, . . .	500	S. H. Fessenden, . . .	100
Walter D. Denegre, . . .	300	Mrs. Edw. Wigglesworth, . . .	100
Harrison K. Caner, . . .	250	Mrs. Charles Hanks, . . .	250
Gardiner M. Lane, . . .	250	William B. Walker, . . .	250
Henry L. Higginson, . . .	250	Mrs. James McMillan, . . .	250
Elizabeth Winthrop, . . .	250	Edward S. Grew, . . .	250
The Misses Curtis, . . .	250	Louis Cabot, . . .	250
Jane N. Grew, . . .	250	Mrs. W. S. Fitz, . . .	250
Francis M. Whitehouse, . . .	250	Gordon Abbott, . . .	250
F. W. Fabyan, . . .	250	Clement S. Houghton, . . .	250
Eben D. Jordan, . . .	250	John L. Thorndike, . . .	250
S. Reed Anthony, . . .	² 200	George Wigglesworth, . . .	250
Mrs. W. C. Cabot, . . .	200	Thomas B. Gannett, . . .	100
T. J. Coolidge, Jr., . . .	200	William J. Boardman, . . .	100
Mrs. Mary R. Bremer, . . .	200	Alex. S. Porter, Jr., . . .	100
R. T. Paine, 2d, . . .	150	Amory Eliot, . . .	100
Mrs. C. P. Hemenway, . . .	150	T. J. Coolidge, . . .	100
T. Dennie Boardman, . . .	100	George Putnam, . . .	100
Dr. R. H. Fitz, . . .	100	George H. Lyman, . . .	100
S. Parker Bremer, . . .	100	William L. Putnam, . . .	50
R. H. Dana, . . .	100	Mrs. George D. Howe, . . .	50
T. K. Lothrop, . . .	100	The Misses Bartlett, . . .	50
Samuel Carr, . . .	100	Mrs. J. S. Sturgis, . . .	50

¹ Available for either moth or road work.² Omitted by error in 1909.

SUBSCRIPTIONS FOR GYPSY MOTH WORK, ETC. — *Concluded.*

Manchester — Concluded.

Richard Stone,	\$50	Russell Tyson,	\$25
Miss E. D. Boardman,	50	John H. Storer,	10
William A. Tucker,	50	Arthur Merriam,	10
Henrietta M. Crosby,	50		
Samuel B. Dana,	50	Total,	\$10,470
Nelson S. Bartlett,	25		

Totals.

Beverly,	\$15,850
Manchester,	10,470
Total,	\$26,320

Magnolia.

John Hays Hammond,	\$500	C. D. Turnbull,	\$100
Miss E. G. Houghton,	250	Mrs. Mary Turnbull,	100
John T. Morse, Jr.,	200	George A. Upton,	75
Charles E. Phenix,	200	James S. Lee,	50
Miss Faulkner,	200	Mrs. J. T. Heard,	50
William H. Coolidge,	100	Miss Georgina Lowell,	50
E. C. Richardson,	100	R. B. Williams,	25
Mrs. L. F. Ayres,	100	Anonymous,	25
W. R. Nelson,	100	Mrs. S. W. Covel,	10
Mrs. William McMillan,	100		
George F. Willett,	100	Total,	\$2,535
J. Harrington Walker,	100		

GYPSY MOTHS SPREAD BY THE WIND.

It is a well-known fact that caterpillars of the gypsy moth are distributed from badly infested colonies on automobiles and teams, and proof is at hand that they have sometimes been carried by farm animals.

During the progress of the gypsy moth work, especially the scouting operations in the territory outside of the badly infested district, many colonies of the insect have been found in locations remote from roadways, and often in wooded areas seldom frequented by men or domestic animals. The repeated occurrence of colonies in such situations rendered it very difficult to explain in a rational way the means by which the insect became established. It has often been suggested that birds might be considered responsible, as some species are known to carry hairy caterpillars to their nesting places for the purpose of feeding their young. The present scarcity in eastern Massa-



Mussell Point, Gloucester, entirely defoliated in 1909; in 1910 cleared, treated and sprayed, -- trees in good condition.

chusetts of birds which are known to feed to any great extent on hairy caterpillars, together with the distance from badly infested areas to new colonies, which was often several miles, renders it improbable that the distribution can be accounted for in this manner. The question also arose in regard to the possibility of birds feeding upon the egg masses of the gypsy moth, and distributing fertile eggs in the excrement at points far removed from where the food was obtained.¹ The location of many of these colonies made this theory improbable, and certain tests which have been made on birds in confinement seem to indicate that it is very unusual for eggs to pass unharmed through the alimentary tract. It is somewhat doubtful whether eggs of this insect are eaten by birds, under natural conditions. Furthermore, the digestive process of birds is carried on very rapidly, and it is improbable that under the most favorable conditions eggs could be conveyed long distances.

As a result of the continual discussion of the reason why certain isolated colonies had come into existence, and of much thought and consideration upon this subject by practically all the officials connected with the gypsy moth work, it was decided to carry on a series of experiments, for the purpose of determining, if possible, whether newly hatched caterpillars of the gypsy moth could be distributed by the wind. Accordingly, early in the spring of 1910 arrangements were made for these tests to be carried on in a co-operative way by the United States Bureau of Entomology and the office of the Massachusetts State Forester. The work was under the general charge of Mr. A. F. Burgess, who was assisted by Mr. C. W. Collins, both of the Bureau. The necessary apparatus and supplies were furnished by the State Forester's office, and also several men who assisted in the work at various times. Among those who should be specially mentioned were Messrs. J. V. Schaffner, Emery Proctor and H. R. Gooch. In planning the experiments, much assistance and valuable advice was given by Messrs. W. F. Fiske and D. M. Rogers of the Bureau, also by Messrs. L. H. Worthley and F. H. Mosher.

¹ Collins, "Some Results from feeding Eggs of *Porthetria dispar* to Birds," *Journal of Economic Entomology*, Vol. 3, No. 4, August, 1910, page 343.

Reiff, "Some Experiments on the Resistance of Gypsy Moth Eggs to the Digestive Fluids of Birds," *Psyche*, Vol. XVII., No. 4, August, 1910, page 161.

Experiments were made in several localities where conditions were suitable for a thorough test. In order to capture caterpillars that might be floating in the air, screens made of ordinary poultry wire were constructed, and treated with a coating of tanglefoot. Two screens of this sort were built on rafts, one of which was moored in the center of Sandy Pond in Lincoln, and the other in Chebacco Lake in Essex. The woodland surrounding these bodies of water was badly infested with the gypsy moth. Another screen was placed on the top of a high tower in the Lynn woods, while still another was exposed on the sides of a tower at Cliftondale.

The results of these experiments were not entirely satisfactory, although a few caterpillars were found on the screen trap on Sandy Pond.

Another test was made by liberating young caterpillars from a station near the center of the salt marshes between Revere and Lynn. These marshes cover a large area, and the experiments were well isolated from any trees or shrubs upon which gypsy moth egg clusters might be found. Small, portable, tangle-footed screens were set up at various distances from the station where boxes containing hatched egg clusters were placed in such a manner that the caterpillars were allowed to crawl out and spin down from one side of the containers. The screens had to be changed frequently, as it was necessary to keep them in line with the direction of the wind. Caterpillars were caught on these screens at distances varying from 50 to 600 feet; and upon one screen which was allowed to remain out during the night of May 11, and which was 1,833 feet from the point of liberation, a single caterpillar was found the following morning.

These experiments demonstrated conclusively that small caterpillars of the gypsy moth may be carried by wind. This method of distribution is probably most frequent when the caterpillars are in the first, or possibly in the second, stage, at which time they spin large quantities of silk for the purpose of lowering themselves from the trees or foliage. It is probable that these insects are often carried long distances in this way, and that large numbers of them perish every year because they fail to come in contact with suitable food.

The result of this investigation shows the grave danger of

permitting large woodland colonies of the gypsy moth to exist, because, when the infestation becomes severe in any area, the opportunity for wide dissemination of the insect increases very rapidly. A study of the gypsy-moth-infested area in New England shows very plainly that localities many miles removed from badly infested areas must have become infested in this manner between the years 1900 and 1905, during the time when no work was done to prevent the spread of this insect. The results also explain the reason why small colonies are being found each year in the outlying towns.

SPRAYING NOT A DESTROYER OF BIRDS.

There has been a general feeling abroad that spraying with arsenate of lead has been and is destroying our birds. In order to determine this matter, we have had many birds sent to the chemist and tested for arsenical or lead poisoning. The results of these examinations have all been in the negative. Similar although more extensive work has been carried on by the State Ornithologist, Mr. E. H. Forbush, the results of which have been published in his annual report for the year 1909, which can be had from the Massachusetts State Board of Agriculture, State House, Boston, upon application. Mr. Forbush examined many birds, first for injury, and second, for poisoning. The following quotation from his report gives a comprehensive statement of conditions:—

Investigations of the possible poisoning of birds by spraying trees with arsenical insecticides were continued through the summer of 1909. The result was inconclusive, but from what we now know it seems probable that the fatal effects of such spraying have been exaggerated both by the people and the press. We cannot say that no birds die from eating live, poisoned insects, from eating poisoned foliage or from drinking poisoned water; but after several years' study of the subject it seems safe to assume that although probably some birds are fatally poisoned, they are the exception and not the rule. Probably there is far more destruction of birds where unsprayed trees are stripped of their foliage by the gypsy moth and the brown-tail moth than where spraying is done and the foliage is saved. The defoliation of the trees by these insects, which exposes the nests of the birds to the sun and rain and to their natural enemies, results in the death of nearly all young birds in a region so defoliated, while the spraying probably

kills at most comparatively few. The dearth of birds in parts of the region infested by the gypsy moth and the brown-tail moth is no doubt due largely to defoliation, as well as to the filling of holes in trees where birds formerly nested, and the cutting down of trees as well as the cutting and burning of underbrush. These operations, which are necessarily a part of the work of the moth suppression, are not destructive to birds if not carried on in the nesting season, but they drive them away. The effect of the spraying operations upon birds may be illustrated by the case of the rose-breasted grosbeak. This bird is very fond of the Colorado potato beetle. Potatoes have been sprayed with Paris green and other arsenical insecticides ever since this beetle first appeared in New England, and there is much circumstantial evidence which seems to point to the death of rose-breasted grosbeaks which have fed among the poisoned potatoes. Nevertheless, the Colorado beetle has furnished a new food supply for the grosbeaks, and the birds appear to be more numerous in Massachusetts than they were forty-five years ago, before the beetle was introduced.

The results of the investigation of the year follow. Letters were sent early in May to many correspondents, and notices were published widely in the press requesting all persons finding dead birds near sprayed trees to send them to the State Ornithologist for examination. Much correspondence resulted and many dead birds were received at this office. Some correspondents were positive that large numbers of birds had been killed by the spraying in their neighborhoods, but most of them failed to produce any dead birds. Many correspondents in Massachusetts and other States, tree wardens, nurserymen, orchardists and others who made a business of spraying trees, and who claimed to have kept a careful watch for dead birds, reported that they had failed to find any. People on whose estates spraying had been done wrote that they had instructed their men to keep a close lookout for dead birds, but that none had been found.

PARASITE WORK.

REPORT OF DR. L. O. HOWARD, CHIEF OF THE BUREAU OF ENTOMOLOGY, WASHINGTON, D. C.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY, WASHINGTON, D. C., Nov. 30, 1910.

Prof. F. W. RANE, *State Forester, 6 Beacon Street, Boston, Mass.*

SIR:—I have the honor to report as follows upon the work done by this Bureau in its co-operation work with your State in the attempt to import and establish in New England the foreign parasites of the gypsy moth and the brown-tail moth, this report covering the period since the submittal of my last report, on Dec. 29, 1909.

Respectfully yours, L. O. HOWARD, *Chief of Bureau.*

The work of the gypsy moth parasite laboratory continued uninterruptedly during the year, consisting of:—

- (a) Importation of parasites and predatory enemies from abroad.
- (b) Rearing these parasites and predators in the laboratory, and wherever possible breeding them in numbers from imported parent stock.
- (c) Colonization in the field of the parasites thus obtained.
- (d) Field work to determine their progress in America.
- (e) Investigations into their biological and general relations.
- (f) Field and laboratory investigations into the parasites of native insects most nearly related to the imported pests either in habit or in natural affinity, with especial reference to the probable effect which the introduction of the foreign parasites will have upon the economy of the native parasites and of their hosts.

Larger quantities of the raw material from which the parasites have been reared have been received than during any other year. This has consisted, as heretofore, of eggs, winter nests, caterpillars and pupæ of the brown-tail moth from Europe; and of eggs, caterpillars and pupæ of the gypsy moth from Europe and Japan; large numbers of adult predatory beetles and thousands of parasite cocoons and puparia. But for numerous reasons, although the amount received was larger, the results obtained, owing partly to the condition of the material on receipt and owing to curious seasonal fluctuations and differences in the countries of origin and in the infested territory in America, the results have by no means corresponded with the increased material.

During the year 1909 two important parasites of the gypsy moth (*Blepharipa* and *Parasetigena*) were imported in large numbers. They were both hibernated successfully, and colonized under ideal conditions in the spring of 1910.

During 1910 determined efforts have been made to secure adequate numbers of several interesting and probably valuable parasites not yet secured in quantities sufficient to provide for satisfactory colonies; but for the most part these attempts seem to have resulted in failure, although final word cannot be said at this time.

As the work goes on, there seem to be almost as many disappointments as successes. For example, no less than one million of the Japanese parasites of the eggs of the gypsy moth were reared during the summer of 1909 and the winter and spring following, and great hopes were entertained for its success, but from the present point of view it appears to be wholly unable to withstand the rigors of the New England winter; and another egg parasite, a European species, of which several hundred thousands were reared in confinement, does not appear to make an impression upon the numbers of the gypsy moth eggs in America.

On the other hand, success of the most promising character has been

reached with others of the imported species. *Calosoma sycophanta*, an imported European predatory beetle, was the first of the imported species to be recovered from the field under circumstances indicative of its ability to exist under American conditions. The season of 1910 is the fourth during which its progress has been conscientiously followed, and during each of these seasons it appears to have combined a steady rate of increase of approximately tenfold, with a rate of dispersion in excess of one mile a year in every direction from the center of the original colony. A tenfold rate of increase annually means that one hundred beetles liberated in 1906 would have increased to one million by 1910, and the actual prevalence of the beetle in the field is such as to make this appear a reasonable estimate of the numbers actually existent. They were so abundant in some localities the past year as to affect the gypsy moth materially, although by no means so materially as to meet and overcome the strong reproductive ability of the pest. If, as there is reason to hope, they will continue to increase at this slow but steady rate for some years to come, their effect upon the present prevailing abundance of the moth will be apparent to all.

Another encouraging example is the Tachinid fly of the genus *Comptosilura*, which attacks both the gypsy and the brown-tail caterpillars as an internal parasite. This species was first liberated in 1906, and was first recovered in 1909 under circumstances indicative of its establishment in America. During 1909 it was found distributed over about five towns adjacent to the one in which the first imported colony was liberated. It was everywhere rare during that year. In 1910 it was expected that it would show a marked increase, but the actual outcome was in excess of all expectations. Instead of a tenfold increase, which would have been considered satisfactory, there seems good evidence that it increased fiftyfold and perhaps much more. It has about equaled *Calosoma* in actual destruction of gypsy moths this year, and in addition has destroyed an appreciable percentage of the brown-tail caterpillars; and it is now turning its attention to such native species as the fall webworm, the tussock moth and other fall-feeding caterpillars. Its increase has been accompanied by a dispersion amounting to ten or twelve miles in every direction as a minimum aggregate during the four years since its first colonization.

Still another example is the European *Monodontomerus*, the recovery of which over a large area was made the subject of especial mention in the last report. This species has continued its satisfactory rate of increase and phenomenal rate of dispersion throughout the year. It is well over the border line in New Hampshire, and appears to be extending its range about ten miles each year, and to be maintaining a twenty-fivefold annual increase.

It has been somewhat disheartening, in the course of the study of the progress of the parasites in the field, to find that certain species liberated under the most favorable conditions cannot be recovered the

next year; and even in the case of two species, both colonized in 1908 and apparently established in 1909, no traces could be recovered in 1910. But, on the other hand, another species (*Zygobothria*), colonized in 1907, was recovered in 1910, three years later, for the first time, — in small numbers, it is true, but over a considerable territory, indicating a rapidity of dispersion sufficient to render a material increase unnoticeable for the first two years.

Another encouraging fact which may be mentioned here is that an important egg parasite (*Anastatus bifasciatus*) seemed this summer to have demonstrated its ability to survive the New England winter, and, having been colonized in 1909, appears to be strongly established in 1910.

On the whole, the results of the work are distinctly more encouraging than they have appeared to be heretofore, and we are by no means disheartened over the non-recovery during the present season of no less than fifteen species which have been colonized. In several instances colonization has been much too recent to make their recovery probable, on account of rapid dispersion; and several others have never been received in sufficient numbers to make a strong colony possible, so that it may well be that establishment has not yet been accomplished. It has been found in the course of this work that there is little hope of the establishment of a colony of less than one thousand individuals, and in many instances of course it has been found impossible to put out so large a number.

The insight which is being gained at the laboratory into many points connected with the biology of these important and interesting insects is resulting in practical knowledge that cannot fail to be of high importance in the continuation of the investigation.

The writer visited Europe in May and June, 1910; visited agents and officials in Italy and France; and, through the courtesy of the Spanish and Portuguese governments, was able to start a new official service in each of these countries for the collection and sending of parasitized gypsy moth larvæ to the United States. In Italy Prof. F. Silvestri of the Royal Agricultural College at Portici, and Dr. Antonio Berlese, Director of the Royal Agricultural Entomological Station at Florence, insisted on the desire to be of service to the United States in this direction, and declined all financial aid. In Spain, Prof. L. Navarro of the Phytopathological Station at Madrid volunteered his services under the same conditions, with the approval of the Minister of Agriculture. In Portugal, Prof. A. F. de Seabra of the Phytopathological Station at Lisbon also volunteered his services, with the permission of Senor Alfredo Carlos Le Cocq, Director of Agriculture. In France, arrangements were made with a paid agent stationed in the south of France; and the same arrangements as in previous years were made with paid agents in Germany and Switzerland. The distributing agency at Hamburg was continued, and a new distributing agency was

started at Havre, on account of its convenient proximity to the American steamers starting from Southampton.

Sendings from Japan were continued in the same manner as during the previous year. The Minister of Agriculture for Japan, at the request of the Secretary of Agriculture of the United States, again designated Prof. S. I. Kuwana of the Imperial Agricultural Experiment Station at Tokio to be its official representative in the work to be carried on during the spring and summer of 1910. Professor Kuwana continued his most valuable sendings.

The thanks of the United States government and of the governments of the States involved are due in high measure to the officials of Italy, Russia, France, Spain, Portugal and Japan, who have assisted in this work. All of them have been named at one time or another in this series of reports.

In the autumn of 1910 Mr. Fiske visited Russia and France for the purpose of studying autumnal conditions of the parasites in their native homes, and in order to obtain information on certain points needed for future work. It seems that the time has arrived to reduce the large bulk of the importations, and in the future to bring over only those species which have not yet been received in sufficient abundance to establish perfect colonies. Mr. Fiske's mission was to study the best methods of bringing this about and to learn something about the probable methods of hibernation of some of the species concerned.

THE FUNGOUS DISEASES OF THE BROWN-TAIL AND THE GYPSY MOTHS.

The State Forester was able to make arrangements with Dean W. C. Sabine and Dr. Roland Thaxter of Harvard University for continuing the co-operative work on fungous diseases, and Mr. A. T. Speare, who has been assisting Dr. Thaxter, was taken over by the State Forester's department. He has devoted his entire time to this work throughout the past season. The following report has been prepared by Mr. Speare:—

The writer having been authorized by the State Forester to continue during the year 1910 the work undertaken in 1909, for the purpose of testing the practical value of artificial infection with fungous diseases of the brown-tail and gypsy moths in the field, desires to present the following preliminary report. Owing to certain experiments which have not been completed, it is not possible at this time to present a full statement. The writer hopes, however, to be able to present early next spring a complete illustrated report of the work that has been done with the parasitic fungi of the brown-tail and gypsy moths. The work

in question is a phase of a project undertaken with the co-operation of Harvard University for the purpose of studying and testing the various diseases of the brown-tail and gypsy moths.

This report comprises, in addition to an account of experiments with the brown-tail *Entomophthora*, a preliminary statement in regard to the successful importation of a corresponding disease of the gypsy moth larvæ by Dr. Clinton, who was sent to Japan for this purpose under the direction of Harvard University in May, 1909.

In order to render the matters of this report intelligible to persons unacquainted with the subject, it seems desirable to give a brief summary of the life history of the *Entomophthora* disease of the brown-tail, with results of the year's work, and a brief account of the first year's experiments with the gypsy moth disease.

The cause of the brown-tail disease is a microscopic plant. The symptoms of this disease are quite peculiar. The caterpillar exhibits no special peculiarities immediately after infection, but at the end of the fourth or fifth day its movements become sluggish; it attempts to eat no more, but seeks some elevated spot. It seems seized with some impulse to get up high. It accordingly crawls upward, becomes attached by certain of its legs, and shortly afterward dies.

The body before this period appears normal externally. Soon after the caterpillar has become fastened to the bark, however, the body becomes rigid. Caterpillars can be found most abundant at this stage from 3 to 5 o'clock in the afternoon. If the body is broken (it can easily be broken), the entire internal tissue of the caterpillar will be seen to have been replaced by creamy-white flocculent or granular matter; this is the vegetative part of the plant. During the night following, if the weather conditions be favorable (a certain amount of moisture), the fungus will further develop by sending spore-bearing organs to the outside of the body. When examined, the next day, the external appearance of the caterpillar will be seen to have changed entirely. Now, instead of the body presenting a normal appearance, the creamy-white matter is seen on the outside. This creamy-white matter is composed of organs which are part of the plant inside, but especially differentiated to produce spores. By a process which we will not detail, the spores are formed, and as the plant absorbs water the spores are literally "shot" into the air to a distance often of three-quarters to one inch from the caterpillar. The result is (if the caterpillar is attached to the branch) the formation of a creamy-white halo on the bark, which is composed entirely of fungous spores, and by which the disease can easily be recognized.

It must be understood, however, that the spores thus seen on the bark do not represent the total discharge, but only a small portion of it. The majority of the spores discharged from the dorsal as well as the lateral sides float off in the air. One can now see the advantage of having the caterpillar in an elevated position when the spore dis-

charge occurs, inasmuch as the higher the larva is, the greater the amount of territory the spores will cover when they are discharged. Spore dissemination is also augmented by winds. These spores when they are discharged into the air float about, and a certain per cent. of them will adhere to healthy caterpillars, on which they will germinate and produce the disease with the symptoms described above.

With the brown-tail the period of incubation (that is, the time from infection to the production of new spores) is from four to six days, varying with the size of the infected individual, the temperature and weather conditions. A well-grown caterpillar under favorable conditions would probably discharge several hundred thousand spores, each capable of infecting a fresh larva in case it comes in contact with one; and among gregarious insects, such as the ones in question, the chance of copious infection is great.

During the past year the field work has been undertaken on a much larger scale than heretofore, and a new method of planting was employed. This spring, instead of planting in isolated places, as has been the custom, a solid block of territory was chosen, comprehending about 10 square miles, and the plantings were all made in this area. Without going into details as to methods of infection, etc., it is enough to state that at the end of the season a mortality of 92 per cent. was estimated throughout this whole area. In parts of this territory not a single live pupa could be found.

This last autumn the writer, not being able personally to plant all of the territory that was deemed desirable, was aided by eight of the division superintendents of the regular moth commission, and with their help 60 isolated plantings were made. Reports that have been received seem to guarantee an average mortality of 38 per cent. in 48 of these 60 plantings. As we believe that the fungus will develop further in these plantings next spring, it seems desirable to wait until after the spring season before estimating the total mortality.

The gypsy *Entomophthora* was successfully carried over winter by means of resting spores, but for reasons which we will not detail the conidial condition (the stage in which the fungus is planted in the field) was not obtained until June 2. The life history of this fungus is very similar to the life history of the brown-tail, and need not be described here. A sufficient amount of infected material could not be obtained for planting until about the middle of June, at which time the gypsy larvæ were quite large. However, 6 plantings were made in isolated places before the close of the season. Although the territories were carefully inspected as often as time permitted, the writer was unable to detect any evidence of the fungus. Owing to the exceptionally hot and dry months of July and August, the fungus may have formed resting spores, in which condition it could have been easily overlooked, as externally this condition resembles in a striking manner the advanced stages of the "wilt." It is of course possible

that this may be the case and that the resting spores may germinate and start infections in the field next spring.

The results of this season's work, however, must not be considered as final in regard to the use of the gypsy *Entomophthora* as a means of destroying the gypsy larvæ. In the first place, the writer was handicapped by starting late; in the second place, the season was very hot and dry (conditions unfavorable for the development of the disease); in the third place, at the time the fungus was introduced the "wilt" was well established in all of the places that were planted with the fungus.

The writer hopes to get the fungus started much earlier this spring, and, with more favorable weather conditions during the summer, hopes at some later date to be able to report more satisfactory results than the above.

THE DISEASE OF THE GYPSY MOTH.

The various lines of work reported on as begun last year under Dr. Theobald Smith of the Harvard Medical School, Prof. W. M. Wheeler of the Bussey Institute of Harvard University and Dr. E. L. Mark of the Harvard Zoölogical Laboratory, were again pursued during the past season.

The work of Dr. Smith, through his assistant, Dr. H. N. Jones, is given below. The work carried out under the supervision of Dr. Wheeler, by Mr. Reiff, will be reported on later. The work carried out by Mr. J. W. Mavor, under the direction of Dr. Mark, has been completed for the present.

FURTHER STUDIES ON THE NATURE OF THE WILT DISEASE OF THE GYPSY MOTH LARVÆ.¹

The season of 1910 afforded an exceptional opportunity for the observation of this most interesting epizootic. Because of the wide distribution and high virulence of the disease in 1909, its prospective appearance in 1910 was awaited with much interest.

Observation of the field conditions the past summer seems to have answered fairly conclusively two important questions regarding the epidemiology of the disease,—questions which suggested themselves before the advent of the season. Would the surviving gypsy moths of the previous year have transmitted to their offspring the immunity for the disease which they themselves seemed to possess? In other words, would the disease limit itself by the nearly complete elimination of susceptible individuals, and after a season of great activity be forced to wait through a number of seasons until a generation with low im-

¹ By Henry N. Jones, Laboratory of Comparative Pathology, Harvard Medical School.

munity should appear? In reply to the above questions, it can be pointed out that, in spite of the heavy mortality from the disease in 1909, most field observers agree that it was much more severe in the past summer. This fact is reassuring, as it relieves the fear that in the conflict with the pest of the gypsy moth we may be deprived of the assistance of this disease. Other conditions, at present unknown, may of course operate in the future for the suppression of this disease; but there seems to be no ground for believing that the general immunity of the gypsy moth will increase to such a degree as may curtail the inroads of the disease.

The second question which suggested itself was this: Would a summer which presented marked variation in climatic conditions from the usual seasonal average appreciably affect the disease or its epidemiology? That is, would an unusual amount of hot weather, or cold weather, or a very dry season, or a very wet summer, affect the disease? Fortunately for the solution of this question, the past summer was unusually dry and warm, with a great amount of sunshine. Apparently the disease is at least in no wise checked by such meteorologic conditions. Should a season appear which presents the reverse of these conditions, it will be very interesting to observe the effect, if any, upon this disease.

The amount of sunshine to which a gypsy moth larva is exposed during its development to maturity depends somewhat upon the environment, and there may be still other factors than sunshine dependent on the environment, such as character of the food supply. Whatever may be the primary cause, it seems evident that larvæ inhabiting a territory where the growth of trees is uniformly very young do not suffer from the disease so early in life nor in such great numbers as do those living on trees of more mature growth.

Observation of the disease in the field, however, although it has revealed several facts which are interesting of themselves, seems to have failed to reveal anything of a broad and fundamental character which might throw some light on the real nature of this disease and the laws governing its transmission.

In the study of this disease in the laboratory the methods used the past summer differed somewhat from those of the previous year, as will appear from the procedures outlined below. The hope was entertained that the study of sectioned material might reveal some very important facts about the pathology of the wilt disease, but this hope was not fulfilled. While it seems that the histological study of normal and diseased caterpillars ought to do much toward the solution of the problem of this disease, yet very many difficulties which seem almost insurmountable are met in the attempt at such a study. The degeneration of the tissues of the animal in this disease is so remarkably rapid and complete, and the chitinous integument is so tough, that the difficulty of cutting good sections can be readily seen. Sections of diseased

animals usually show nothing but the skin, intestinal tract, tracheal system, and, if the histolysis has not progressed too far, fragments of the musculature. It seemed evident that the process of tissue digestion, which seems to constitute the most remarkable feature of the disease, first attacks the fat bodies and later the muscles, while the chitinous structures naturally survive intact for an indefinite time. Probably it may be more accurate to say that the tissues are able to resist the action of the enzyme, or whatever it may be, in the order named, rather than that the disease attacks them in that order. It is also interesting to note that the digestive tract not only remains intact, but that often undigested food is found in the intestine of animals whose tissues have undergone complete dissolution. No trace of anything that could be considered a parasite could be found.

In the bacteriological study of the disease, the dead and living larvæ were opened aseptically and cultures then made both from the blood and from the intestinal contents. Many of the tubes of broth thus inoculated even from the dead larvæ remained entirely sterile, and several times the only growth obtained was the common white mold. The different species of bacteria isolated behaved as a non-pathogenic intestinal flora. Organisms which possessed the power of liquefying gelatine were only occasionally met with. The only organism isolated with any fair degree of constancy from the caterpillars was the small, motile, diplo-bacillus described in the report of the work for 1909.

The microscopical examination of the larvæ while fresh rarely showed bacteria to be present in more than small numbers. Indeed, the body fluids of the dead larvæ seemed to be quite remarkable for their rather singular freedom from bacterial life, presenting as they did a marked contrast to the usual abundant flora of body fluids exposed to invasion by saprophytic bacteria. The caterpillar's relative freedom from bacteria, as contrasted with the condition of the higher animals, is doubtless to be explained, in part at least, by two conditions. The food of the gypsy moth larvæ is evidently singularly free from bacteria, and few of those bacteria introduced into the intestinal tract find conditions favorable for their multiplication; hence the intestinal tract of the caterpillars is exceptionally free from bacterial life, and the tough chitinous outer integument effectively prevents the post-mortem invasion of bacteria through the surface.

In order to compare the changes occurring in the bodies of larvæ killed by various agencies with the changes occurring in larvæ dying by disease, many larvæ were killed. The attempt was first made to kill the caterpillars by severe trauma, viz., crushing the head with a nip of the forceps. Strange as it may seem, however, to those accustomed to observing only the higher animals, it was found that, owing to the absence of a complex nervous system in the caterpillar, it was altogether impracticable to kill the animals by any injury which stopped much short of their total disintegration. The caterpillar of

the gypsy moth possesses such extraordinary tenacity of life that it is not noticeably affected by the complete crushing of its head, living on in this mangled condition indefinitely until starvation occurs. It is also very resistant to the vapors of alcohol and chloroform, so that it cannot be satisfactorily killed by such means.

It was found that the post-mortem appearance of the larvæ killed by drowning never at any time resembled that of those that had died of the disease. At no time did the bodies of the drowned become flaccid, nor were the body contents transformed into a fluid condition.

Attempts were made in several ways to transmit the disease to apparently normal larvæ, but the results were not satisfactory. Such a large percentage of animals among the controls die under what are considered the best of conditions, that the greatest care is necessary in interpreting the results of infection experiments.

Cultures of various bacteria isolated from dead larvæ were injected into the hæmocoele of normal animals. These bacteria could be found in the blood, in enormous numbers, for a considerable time after inoculation, sometimes as long as seventy to eighty hours. They were never recovered after the third day, if the animal survived, and were much less numerous on the second day than on the first. Several pupæ were also inoculated with a small quantity of a pure culture of bacillus A. These animals harbored the bacteria in quantities for fourteen days, and died without maturing.

The presence of the so-called "polyhedral bodies," which several observers have considered of significance, was constant in the fluids of the diseased caterpillars. These bodies are presumably similar to those described by Bolle, and thought by him to be protozoa (*Microsporidium polyhedricum*), and concerned in the production of a disease in silk worms which seems to be quite similar clinically to the disease of our gypsy moth larvæ. Several other investigators have noted the presence of these bodies in diseased conditions of the silk worm, and some have agreed with Bolle in considering them to be protozoa; while others, particularly Sasaki of Tokio, are unable to satisfy themselves that they are more than some degeneration product of the body tissues. The opportunity was afforded for examining the tissues of young silk worms obtained through Dr. Bolle, and said to be infected with *Microsporidium polyhedricum*. Large numbers of polyhedral bodies were to be found apparently not differing from those to be found in the fluids of caterpillars dying of the so-called wilt disease in this country. Nothing could be observed, either in the structure or reactions of these bodies, as found in the gypsy moth larvæ, which could possibly be interpreted as indicating that they were living organisms. The observations of Sasaki as to the reactions to chemicals and appearance of these bodies were confirmed. The splitting of these bodies into sectors which Sasaki mentions as occurring when the bodies are subjected

to pressure, was frequently noticed when the bodies had been subjected to no known pressure. This action seemed to be due entirely to internal stresses acting on the bodies.

In addition to these polyhedral bodies, which were always found in enormous numbers in the fluids of the sick and dead larvæ, there were frequently to be found in the blood of normally appearing caterpillars certain bodies of a very different appearance. These consisted of a variable number (12 to 18 or more) of hyaline bodies, 4 to 5 microns in diameter, nearly round, which were bound in a compact mass by a thin, external envelope. These masses were sometimes so numerous in the blood that several could usually be found in a single field of the 2 mm. immersion lens. These are apparently cells of the body which, during certain changes of the body metabolism preceding molting, and probably at the onset of the disease, are freed in abnormal numbers into the circulatory system. They are apparently similar to the "*cellules amiboides granuleuses*" which Janet describes in a paper on the anatomy of the thorax of the ant, although amœboid motion was never observed. The examination of the blood of a considerable number of apparently normal caterpillars would always reveal some in whom the blood presented an opaque, clouded appearance, much like bouillon with a bacterial growth. The microscopical examination of such bloods always showed the presence of considerable numbers of these cells and greater or smaller numbers of the polyhedral bodies. It was observed that this condition of the blood portended one of two things: either the animal so afflicted molted, or died of the "wilt."

All that can be said regarding the nature of the cause of this disease at present is that, while many interesting hypotheses may suggest themselves, such as the possibility of its being a curious miscarriage of the function of molting, what few data of any value have been obtained are entirely of a negative character; and that we must await the results of much further investigation for the final solution of this most interesting and important problem.

Papers to which reference has been made: (a) Johann Bolle, *Der Seidenbau in Japan (die Gelb oder Fettsucht der Seidenraupe, — eine parasitäre Krankheit)*. (b) Professor Sasaki, *On the Pathology of the Jaundice of the Silk-worm (Journal of the College of Agriculture)*. (c) Charles Janet, *Anatomie du Corselet et histolyse des Muscles vibrateurs, après le vol nuptial, chez la reine de la Fourmi*.

BULLETIN ON PARASITES.

There seemed to be a desire on the part of many of our people to know more in detail than has been given them in the past about the parasitic work which the State has been carrying on since 1905; and it was to give this information that the

United States Entomologist, Dr. L. O. Howard, who has been our chief adviser in this work, was prevailed upon to have a bulletin prepared. This bulletin, entitled "Parasites of the Gypsy and Brown-tail Moths introduced into Massachusetts," was published by the State Forester and distributed generally. The bulletin was written by Mr. W. F. Fiske, expert in charge of the State laboratory at Melrose Highlands. This bulletin, which gives a comprehensive idea of the work being undertaken by the State, has been well received. It can be had by any one interested, by applying to the State Forester.

POST CARDS IN COLORS.

During the past season the State Forester had printed fifteen thousand each of three different post cards, illustrating in natural colors and size the various transformations in the life histories of the gypsy moth, the brown-tail moth and the *Calosoma sycophanta* beetle.

Although the above-named moths have both been extremely destructive in eastern Massachusetts, it has not been uncommon to find that our people are continually mistaking one for the other. During last year even some of our newspaper reporters made this common mistake.

These illustrated cards have served to clearly set forth the characteristics of each moth. Besides giving their natural size and color, the cards contained a brief description of each insect, together with a statement of the most economical method of treatment. In the case of the *Calosoma* beetle the object of printing the card was to familiarize every one with the insect, so as to give it protection. It is an insect imported for the purpose of assisting in destroying the gypsy and brown-tail moths.

These three post cards have been greatly sought after by our people, and served very nicely for educating our young in the schools.

They can be had by our Massachusetts people by applying to the State Forester, 6 Beacon Street, Boston.



This hand cart is economically used in the moth work, as all necessary tools for supplying a working crew can be easily transported, and the customary expense of horse hire saved.

FINANCIAL STATEMENTS.

In our financial statement, given below, we show a balance of \$19,992.47. This balance will be disbursed during the coming month in reimbursements to towns and cities which have not yet returned final papers of the year's expenditure to this office.

General Appropriation.

Balance from 1909,	\$4,143 05	
Appropriation for 1910,	150,000 00	
Appropriation of March 18, 1910,	150,000 00	
Cash returned by Merrimac Chemical Com- pany,	850 68	
Cash transferred from special North Shore fund for tools and supplies furnished,	13,870 81	
	<hr/>	\$318,864 54

Office expenses:—

Salaries of clerks,	\$2,391 50
Rent,	2,454 17
Stationery and postage,	1,347 25
Printing,	835 42
Experts,	100 00
Furniture, etc.,	32 75
Sundries,	1,004 65
Educational work,	14 77

Field expenses:—

Wages of employees,	24,951 39	
Travelling expenses,	9,106 63	
Supplies,	86,740 98	
Special work,	22,500 00	
Supplies for experiment,	1,231 58	
Sundries,	895 77	
Reimbursement,	145,265 21	
	<hr/>	298,872 07

Balance on hand Nov. 30, 1910,	\$19,992 47
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Parasite Appropriation.

Balance from 1909,	\$11,530 46	
Appropriation of March 18, 1910,	15,000 00	
Cash returned by American Express Com- pany,	7 70	
	<hr/>	\$26,538 16

Expenditures:—

Wages of employees,	\$11,193 10	
Travelling expenses,	1,868 12	
Rent,	380 00	
Supplies,	1,232 34	
Stationery and postage,	166 51	
Printing,	1,332 40	
Experts,	162 00	
Sundries,	846 07	
Supplies for experiment,	23 80	
Importation of parasites,	5,654 47	
	<hr/>	\$22,858 81
Balance on hand Nov. 30, 1910,		\$3,679 35

Special North Shore Fund.

Balance from 1909,	\$773 05	
Deposit by F. W. Rane, State Forester,	22,500 00	
Deposit by Wm. D. Sohler, agent,	22,500 00	
Deposit by city of Gloucester,	2,500 00	
Deposit by city of Beverly,	5,000 00	
Deposit by town of Manchester,	7,500 00	
Cash returned for error on pay roll,	12 00	
Cash received for work on private estates,	4,409 50	
Cash returned to fund for accounts un- drawn,	27 06	
	<hr/>	\$65,221 61

Expenditures:—

Wages of employees,	\$39,720 14	
Travelling expenses,	846 23	
Rent,	181 00	
Supplies,	15,950 39	
Stationery and postage,	1 16	
Printing,	1 25	
Sundries (including teaming),	3,597 57	
	<hr/>	60,297 74

Balance on hand Nov. 30, 1910,	\$4,923 87
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Financial Summary by Towns.

The following table shows the reimbursement paid to cities and towns for 1908 and 1909, the total net expenditure, the required expenditure before receiving reimbursement and the amount of reimbursement in 1910, and also the required expenditure for 1911:—

	1908. Re- imburse- ment.	1909. Re- imburse- ment.	1910.			1911. Required Expendi- ture.
			Required Expendi- ture.	Total Expendi- ture.	Re- imburse- ment.	
Abington,	\$1,493 44	\$796 28	\$1,175 93	\$915 49	—	\$1,220 85
Acton,	2,485 81	1,764 27	782 26	2,051 73	\$1,269 47	882 65
Amesbury,	378 10	—	2,434 83	2,177 29	—	2,498 99
Andover,	2,365 17	3,095 55	2,588 47	3,918 47	877 77	2,694 88
Arlington,	6,109 09	4,931 26	4,591 97	6,303 41	1,126 27	4,754 91
Ashburnham,	—	—	384 28	—	—	410 75
Ashby,	—	—	212 71	—	—	211 42
Ashland,	341 24	49 31	477 13	560 05	82 92	500 57
Athol,	—	—	1,827 80	—	—	1,857 48
Attleborough,	—	—	5,000 00	—	—	5,000 00
Auburn,	—	—	492 60	—	—	523 20
Avon,	—	—	384 84	506 77	121 93	388 79
Ayer,	—	—	835 41	—	—	871 30
Barnstable,	—	—	2,317 10	—	—	2,456 11
Barre,	—	—	741 20	—	—	820 20
Bedford,	9,466 72	4,608 85	522 90	2,701 02	2,178 12	553 31
Bellingham,	—	—	335 96	—	—	362 66
Belmont,	572 93	164 32	2,511 51	2,146 94	—	2,606 61
Berlin,	460 83	362 95	221 62	572 89	351 27	236 67
Beverly,	1,889 61	818 44	5,000 00	5,698 38	349 19	5,000 00
Billerica,	6,091 09	4,238 66	974 32	3,951 12	2,976 80	1,004 35
Blackstone,	—	—	908 09	—	—	926 16
Bolton,	411 07	686 65	199 14	774 05	574 91	233 44
Boston,	2,500 00	10,000 00	5,000 00	46,561 24	20,000 00	5,000 00
Bourne,	1,489 01	791 61	1,641 55	—	—	1,956 15
Boxborough,	1,805 43	1,438 47	106 79	1,281 67	1,174 88	106 40
Boxford,	2,066 35	2,843 56	520 74	2,517 35	1,996 61	570 00
Boylston,	—	—	193 06	—	—	197 51
Braintree,	1,445 27	—	2,421 92	—	—	2,506 35
Brewster,	—	—	246 40	—	—	272 62
Bridgewater,	—	143 48	1,328 11	1,272 56	—	1,387 13
Brockton,	—	—	5,000 00	—	—	5,000 00
Brookfield,	—	—	508 57	—	—	516 72
Brookline,	—	—	5,000 00	—	—	5,000 00
Burlington,	5,599 44	2,287 91	250 36	2,669 82	2,419 46	278 15
Cambridge,	—	—	5,000 00	—	—	5,000 00
Canton,	—	—	1,654 31	3,046 17	1,391 86	1,816 78
Carlisle,	5,485 58	2,949 83	182 89	2,282 65	2,099 76	190 88

	1908. Re- imburse- ment.	1909. Re- imburse- ment.	1910.			1911. Required Expendi- ture.
			Required Expendi- ture.	Total Expendi- ture.	Re- imburse- ment.	
Carver,	\$3,641 27	\$1,167 64	\$601 89	\$1,590 84	\$988 95	\$843 90
Charlton,	-	-	517 18	-	-	536 06
Chelmsford,	3,740 98	2,057 85	1,809 64	3,282 26	1,472 62	1,767 98
Chelsea,	-	-	5,000 00	-	-	5,000 00
Clinton,	-	-	3,309 63	1,778 02	-	3,375 96
Cohasset,	936 40	3,197 76	3,061 17	5,273 43	1,578 28	3,560 69
Concord,	5,169 66	5,195 79	2,716 27	7,719 43	3 519 62	2,927 71
Danvers,	6,441 71	2,318 50	2,404 85	4,629 51	1,650 86	2,588 17
Dedham,	-	-	5,000 00	-	-	5,000 00
Dennis,	-	-	489 60	-	-	522 72
Douglas,	-	-	493 52	-	-	509 95
Dover,	1,487 56	2,884 61	2,131 26	1,197 55	-	2,189 97
Dracut,	2,462 61	1,218 05	939 68	1,432 65	492 97	988 45
Dudley,	-	-	686 27	-	-	512 77
Dunstable,	544 67	938 24	131 58	1,569 01	1,437 43	142 28
Duxbury,	3,381 91	857 39	881 61	1,366 84	485 23	919 36
East Bridgewater,	3,945 78	902 27	831 45	1,218 83	387 38	834 95
Easton,	-	-	2,115 65	-	-	2,307 89
Essex,	2,096 22	1,099 97	456 91	1,556 49	1,099 58	473 03
Everett,	-	-	5,000 00	1,856 66	-	5,000 00
Falmouth,	-	-	3,243 69	-	-	3,500 67
Fitchburg,	-	-	5,000 00	-	-	5,000 00
Foxborough,	-	-	911 11	-	-	965 99
Framingham,	-	-	4,226 59	2,630 46	-	4,785 18
Franklin,	-	-	1,517 82	-	-	1,575 46
Gardner,	-	-	3,071 08	-	-	3,298 36
Georgetown,	1,151 67	2,055 66	410 16	2,387 65	1,977 49	414 86
Gloucester,	2,063 54	947 56	5,000 00	7,603 17	1,276 59	5,000 00
Grafton,	-	-	1,067 88	362 55	-	1,095 75
Greenfield,	-	-	3,853 77	-	-	4,052 15
Groton,	-	196 72	1,515 70	1,780 73	265 03	1,585 36
Groveland,	1,711 10	1,668 76	465 07	1,506 91	1,041 84	465 39
Halifax,	2,237 83	821 89	213 70	865 04	651 34	213 70
Hamilton,	3,167 63	1,129 22	1,519 37	2,327 35	807 98	1,605 62
Hanover,	4,054 60	1,289 06	591 95	1,030 76	438 81	605 78
Hanson,	1,871 39	691 79	431 80	1,074 38	642 58	502 04
Harvard,	616 61	748 40	493 48	1,266 20	772 72	545 52
Haverhill,	1,131 62	286 52	5,000 00	6,174 37	587 18	5,000 00

	1908. Re- imburse- ment.	1909. Re- imburse- ment.	1910.			1911. Required Expendi- ture.
			Required Expendi- ture.	Total Expendi- ture.	Re- imburse- ment.	
Hingham, . . .	\$1,877 15	\$1,000 00	\$2,441 02	\$2,753 38	\$13 88	\$3,152 60
Holbrook, . . .	-	-	580 26	-	-	590 44
Holden, . . .	-	-	651 99	-	-	658 02
Holliston, . . .	-	-	663 04	-	-	658 07
Hopedale, . . .	-	-	2,096 12	-	-	2,371 14
Hopkinton, . . .	810 16	343 49	631 34	811 19	179 85	623 69
Hubbardston, . . .	-	-	275 85	-	-	275 04
Hudson, . . .	999 59	7 46	1,570 08	1,553 32	-	1,537 45
Hull, . . .	-	-	2,161 33	-	-	2,807 54
Hyde Park, . . .	-	-	5,000 00	476 14	-	5,000 00
Ipswich, . . .	1,757 80	1,236 69	1,914 70	2,769 44	854 74	1,914 20
Kingston, . . .	861 00	889 64	640 91	2,822 56	2,181 65	646 34
Lakeville, . . .	-	-	280 54	-	-	328 37
Lancaster, . . .	-	-	1,656 83	-	-	1,765 67
Lawrence, . . .	-	-	5,000 00	-	-	5,000 00
Leicester, . . .	-	-	965 45	78 70	-	982 62
Leominster, . . .	-	-	4,788 85	-	-	4,959 29
Lexington, . . .	11,139 99	5,306 58	2,903 12	7,596 87	3,343 60	3,130 79
Lincoln, . . .	5,000 00	2,084 18	1,216 10	2,228 37	1,012 27	1,389 57
Littleton, . . .	1,716 01	1,051 05	428 94	1,758 25	1,329 31	454 77
Lowell, . . .	120 42	-	5,000 00	6,835 40	718 86	5,000 00
Lunenburg, . . .	81 34	-	441 06	793 48	352 42	463 73
Lynn, . . .	{ 1,133 22 3,084 27 }	-	5,000 00	1,755 63	-	5,000 00
Lynnfield, . . .	2,982 45	1,530 23	312 84	1,576 12	1,263 28	397 92
Malden, . . .	-	-	5,000 00	3,543 94	-	5,000 00
Manchester, . . .	-	-	5,000 00	-	-	5,000 00
Mansfield, . . .	-	-	1,580 27	-	-	1,711 68
Marblehead, . . .	-	-	3,101 54	1,913 19	-	3,514 38
Marion, . . .	-	-	1,763 45	-	-	1,993 87
Marlborough, . . .	580 83	369 94	4,128 37	3,803 98	-	4,169 23
Marshfield, . . .	2,389 25	824 61	767 20	1,673 48	906 28	782 93
Mashpee, . . .	104 77	439 05	87 88	633 74	545 86	90 51
Maynard, . . .	1,551 28	654 30	1,548 29	1,539 12	-	1,573 37
Medfield, . . .	-	-	638 60	-	-	639 28
Medford, . . .	4,006 11	4,000 00	5,000 00	10,355 86	2,184 42	5,000 00
Medway, . . .	-	-	579 19	391 78	-	595 12
Melrose, . . .	1,500 00	-	5,000 00	1,840 67	-	5,000 00
Mendon, . . .	-	-	291 48	-	-	280 58

	1908. Re- imburse- ment.	1909. Re- imburse- ment.	1910.			1911. Required Expendi- ture.
			Required Expendi- ture.	Total Expendi- ture.	Re- imburse- ment.	
Merrimac, . . .	\$1,598 02	\$1,498 21	\$498 68	\$1,171 29	\$672 61	\$531 01
Methuen, . . .	3,334 00	1,776 41	2,453 32	3,622 94	808 86	2,879 21
Middleborough, . . .	-	377 46	1,885 95	2,041 33	155 38	1,857 92
Middleton, . . .	2,012 23	1,237 45	316 51	1,430 55	1,114 04	327 33
Milford,	-	-	3,485 24	-	-	3,732 59
Millbury,	-	-	917 32	-	-	941 74
Millis,	-	-	398 03	198 53	-	440 95
Milton,	-	-	5,000 00	6,343 76	7 89	5,000 00
Nahant,	-	-	2,451 60	-	-	3,290 10
Natick,	4,613 56	615 63	3,133 48	3,510 68	-	3,288 64
Needham,	2,443 84	1,254 29	2,322 78	2,373 61	50 83	2,442 13
Newbury,	5,187 19	3,206 28	492 99	2,674 82	2,181 83	505 45
Newburyport,	-	-	4,907 89	-	-	5,000 00
Newton,	2,730 67	8,000 00	5,000 00	28,906 25	7,000 01	5,000 00
Norfolk,	-	-	331 80	-	-	349 08
North Andover,	3,238 23	3,045 08	1,841 44	2,192 20	350 76	1,975 09
North Attleborough,	-	-	2,737 98	-	-	3,092 90
North Reading,	2,757 26	2,807 28	542 32	2,110 70	1,830 05	294 56
Northborough,	-	-	1,744 38	-	-	556 54
Northbridge,	-	-	280 65	-	-	1,837 84
Norwell,	2,291 57	1,019 70	367 98	1,309 50	941 52	423 62
Norwood,	-	-	5,000 00	-	-	5,000 00
Orange,	-	-	1,445 19	-	-	1,481 88
Orleans,	-	-	252 53	-	-	273 60
Oxford,	-	-	775 25	-	-	786 53
Palmer,	-	-	1,671 17	-	-	1,745 87
Paxton,	-	-	133 18	-	-	135 80
Peabody,	4,208 67	1,698 36	4,156 73	4,940 92	627 35	4,436 42
Pembroke,	1,109 72	791 90	376 90	1,511 55	1,134 65	381 62
Pepperell,	870 79	745 59	901 22	2,471 76	1,570 54	155 05
Petersham,	-	-	360 87	-	-	374 33
Phillipston,	-	-	113 54	-	-	113 48
Plainville,	-	-	317 85	-	-	328 78
Plymouth,	-	-	4,346 09	-	-	4,510 32
Plympton,	5,504 87	1,780 71	150 30	1,702 50	1,552 20	155 05
Princeton,	-	-	438 87	-	-	454 15
Quincy,	1,550 24	55 52	5,000 00	4,692 51	-	5,000 00
Randolph,	-	-	826 48	-	-	922 96

	1908. Re- imburse- ment.	1909. Re- imburse- ment.	1910.			1911. Required Expendi- ture.
			Required Expendi- ture.	Total Expendi- ture.	Re- imburse- ment.	
Raynham,	\$70 80	-	\$307 47	\$327 69	\$20 22	\$309 49
Reading,	6,974 30	\$5,293 45	2,181 77	3,952 73	1,770 96	2,358 75
Revere,	-	-	5,000 00	1,941 63	-	5,000 00
Rochester,	96 34	98 75	257 35	353 05	95 70	289 38
Rockland,	675 17	193 22	1,589 06	1,519 45	-	1,690 45
Rockport,	800 34	240 66	1,309 19	1,843 81	534 62	1,370 67
Rowley,	1,047 73	1,026 59	298 94	1,192 46	893 52	367 45
Royalston,	-	-	228 19	-	-	240 82
Rutland,	-	-	288 47	-	-	312 49
Salem,	2,818 68	334 00	5,000 00	5,367 11	183 56	5,000 00
Salisbury,	2,103 91	1,290 50	356 54	1,614 11	1,257 57	363 15
Sandwich,	494 08	128 83	405 29	544 45	139 16	410 53
Saugus,	12,243 30	7,747 29	2,082 51	6,226 00	4,143 49	2,204 21
Scituate,	-	1,351 60	1,790 26	2,795 31	1,005 05	1,863 08
Sharon,	-	-	1,105 51	-	-	1,114 01
Sherborn,	1,463 82	756 34	592 24	820 96	228 72	556 54
Shirley,	-	-	433 69	541 10	107 41	478 45
Shrewsbury,	-	-	653 07	-	-	697 72
Somerville,	-	-	5,000 00	668 62	-	5,000 00
Southborough,	984 33	1,105 88	733 56	984 72	251 16	779 71
Spencer,	-	-	1,416 42	-	-	1,414 28
Springfield,	-	-	5,000 00	-	-	5,000 00
Sterling,	-	-	453 08	-	-	466 91
Stoneham,	8,052 48	2,637 99	2,021 00	2,275 18	254 18	2,022 37
Stoughton,	-	-	1,399 13	-	-	1,422 00
Stow,	773 80	878 52	375 39	1,516 25	1,140 86	409 87
Sturbridge,	-	-	426 65	-	-	439 63
Sudbury,	2,390 60	1,550 53	501 99	1,891 06	1,389 07	526 98
Sutton,	-	-	516 34	-	-	527 21
Swampscott,	1,509 10	-	4,050 37	4,547 50	397 71	4,475 02
Taunton,	-	-	5,000 00	-	-	5,000 00
Templeton,	-	-	634 61	-	-	648 87
Tewksbury,	1,771 69	1,745 42	508 38	1,975 10	1,466 72	586 94
Topsfield,	1,725 26	1,404 32	508 09	1,503 54	995 45	635 73
Townsend,	-	-	469 92	1,037 11	567 19	530 33
Truro,	-	-	149 06	-	-	151 65
Tyngsborough,	1,505 38	1,892 27	223 53	2,061 04	1,837 51	231 92
Upton,	-	-	444 37	-	-	450 27

	1908. Re- imburse- ment.	1909. Re- imburse- ment.	1910.			1911. Required Expendi- ture.
			Required Expendi- ture.	Total Expendi- ture.	Re- imburse- ment.	
Uxbridge,	-	-	\$1,140 23	-	-	\$1,197 32
Wakefield,	\$4,297 83	\$1,446 07	3,635 64	\$5,438 50	\$1,190 98	3,752 22
Walpole,	-	-	1,750 25	649 90	-	2,161 03
Waltham,	3,340 13	616 60	5,000 00	7,008 12	224 99	5,000 00
Wareham,	-	-	1,884 49	-	-	2,025 56
Warren,	-	-	769 59	-	-	761 50
Warwick,	-	-	171 39	-	-	176 98
Watertown,	399 36	-	5,000 00	3,513 49	-	5,000 00
Wayland,	4,603 00	2,989 29	937 77	2,895 98	1,956 51	1,136 06
Webster,	-	-	2,962 92	-	-	3,115 91
Wellesley,	587 42	886 08	5,000 00	5,585 70	249 77	5,000 00
Wellfleet,	-	-	495 76	-	-	438 36
Wenham,	1,577 95	2,977 10	1,007 04	1,599 72	592 68	1,027 19
West Boylston,	-	-	311 89	-	-	330 82
West Bridgewater,	1,342 17	499 40	508 54	824 08	315 54	536 87
West Newbury,	7,316 20	2,838 64	430 97	1,097 77	666 80	429 67
Westborough,	-	-	1,306 06	-	-	1,297 66
Westford,	2,727 41	2,165 92	733 29	3,297 22	2,563 93	772 89
Westminster,	-	-	314 09	312 87	-	344 52
Weston,	10,541 99	4,600 00	2,733 10	5,052 73	1,078 63	2,769 70
Westwood,	-	-	1,038 27	-	-	1,180 14
Weymouth,	1,542 86	300 73	3,197 19	2,341 38	-	3,143 23
Whitman,	-	-	1,949 34	-	-	1,997 89
Wilmington,	3,803 51	2,974 23	555 91	2,347 00	1,791 09	609 12
Winchendon,	-	-	1,644 50	-	-	1,673 72
Winchester,	808 08	-	4,988 65	3,704 73	-	5,000 00
Winthrop,	-	-	4,797 44	-	-	5,000 00
Woburn,	7,624 59	5,969 40	4,478 69	8,872 57	3,263 35	4,596 60
Worcester,	-	-	5,000 00	-	-	5,000 00
Wrentham,	-	-	480 48	-	-	512 36
Yarmouth,	-	-	834 74	-	-	886 01

SUMMARY OF RECOMMENDATIONS.

For General Forestry.

First. — To enact a law defining the powers and duties of the State Forester with regard to forest fires.

Second. — To enact a law regulating the handling of brush, or slash, throughout the State, in order to lessen the danger of fire.

Third. — That the law requiring permits to set fires in the open air be so amended as to apply to all cities and towns in the Commonwealth; also, to lengthen the time during which such permits are required, so as to include the month of March.

Fourth. — That an increased appropriation be made to carry on the work of reforestation, and for the general expenses of the State Forester's department.

For Moth Suppression.

Fifth. — That the law relative to the suppression of the gypsy and brown-tail moths be so amended that the State Forester may take supervision of the work in cities and towns so desiring it, or where economy and efficiency demand it.

Sixth. — That the usual additional appropriation for gypsy and brown-tail moth suppression, and the importation of their natural enemies, which has been \$165,000, be again made this year.

Seventh. — The passage of a resolution by the Massachusetts Legislature, urging upon the Congress of the United States the necessity for more assistance in suppressing and checking the spread of the gypsy and brown-tail moths.

Eighth. — That the appropriations be made available by March 1, as more economic results can thus be obtained.

Respectfully submitted,

F. W. RANE,
State Forester.

THE
STATE FORESTER
OF
MASSACHUSETTS.

EIGHTH ANNUAL REPORT.
1911.

F. W. RANE, STATE FORESTER.



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FRABELL STATE
TO
ATTORNEY GENERAL

The Commonwealth of Massachusetts.

To the General Court.

It is with pleasure that the State Forester presents this, his eighth annual report, which covers the work of this department during the year, with recommendations for the future needs of the department.

The report is divided into two parts:—

Part I. General Forestry.

Part II. Gypsy and Brown-tail Moth Work.

This report is submitted in accordance with the provisions of chapter 409, section 5, Acts of 1904.

Respectfully submitted,

F. W. RANE,
State Forester.

DEC. 10, 1911.

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The first power truck sprayer ever invented. Built by the Massachusetts State Forester in 1911 for spraying in the gypsy and brown-tail moth work. The whole outfit was designed and built for this work, and promises to revolutionize the question of spraying, particularly roadside, park and shade tree work, in combating insect and fungous depredations. It can be used for forest fire work as well. The same engine that propels the truck also imparts the power for spraying. See description elsewhere.

The Commonwealth of Massachusetts.

EIGHTH ANNUAL REPORT OF THE STATE FORESTER.

INTRODUCTION.

It has been the constant aim of the State Forester to establish a forest policy worthy of Massachusetts interests. Year by year, through the splendid support given by our public-spirited citizens and various organizations, we have made constant progress. By perusing the annual reports of the State Forester it may be seen that each year the General Court has recognized the importance of the work and has encouraged a steady development.

In submitting this, the eighth annual report, it is certainly a great pleasure to be able to state that, through the generous consideration of the last General Court, we have been able finally to perfect a State-wide forest fire policy that promises very great economy. With an up-to-date patrol and look-out system for forest fires, backed by a strong and efficient town and city forest warden unit of organization, already well established, together with the perfecting and adapting of previous laws, we now can boast of being in a position adequate for natural growth and development.

I am frank to say that there never has been a more wholesome, co-operative interest shown toward this department than during the present season, and this, too, following an apparent misunderstanding on the part of a few of our legislators last session, who finally gave the department their support.

I firmly believe that ultimately Governor Foss's first year's administration will be as noted for its establishment of a State-wide forest fire protective policy as any legislation enacted during the session. When we once can assure our people that forest fires can and will be controlled, there will be little trouble to interest

capital in reforestation. With fire protection and a rapidly increasing interest in modern forestry, which no one can deny is prevalent even at present, it only remains for the casual observer to predict what we may be able to accomplish in Massachusetts.

The various lines of work in this department have been explained quite fully in past reports, and it is necessary only to state that the work throughout the year has even surpassed any other. The requests for examinations and advice have been far in excess of our ability to meet them with our present force. Forestry literature has been in great demand, and several bulletins have been revised and reprinted, besides much new material sent out. Lectures and demonstrations have been constantly requested, and as many given as conditions would permit. Forest laws and fire-warning posters have been posted fully by our wardens throughout the State.

Towns generally are awakening to the necessity of being equipped with modern fire-fighting apparatus if they are to encourage forestry in their midst. The towns with a valuation of \$1,500,000 or less are taking advantage of the State's offer of assistance, and it is predicted that the usual appropriation by the State of \$5,000 will be utilized immediately following the spring town meetings. As usual, those towns with equipment and organization have kept forest fires under control, while other towns have suffered.

The work of reforestation continues as popular as ever, and I am convinced that if the Legislature could see its way clearly to enlarge greatly the present appropriation for this work, we could readily plant many times our present annual acreage. Our reforestation act is unique and is proving a success. The work in this line will be far better appreciated in a few years, when the young trees have grown to a more desirable size.

The gypsy and brown-tail moth work, while still a very perplexing problem, is better understood and more intelligently combated than ever. Our people are finding out that the best way to fight these pests is to take advantage of the advice and assistance that experience has taught us. This office is in a position to advise and assist in this work throughout the infested territory. The division superintendents are men of ripe experience, and the local superintendents are more efficient and in better control of their conditions than ever before.

If, as we now have reason to believe, it is soon to come to pass

that the United States government will take over the parasitic work which the State has financed up to the present, and also assume the work of controlling the spread of the moth, then our State work will resolve itself down to internal self-preservation in the present infested territory. With this arrangement, I believe the State ought to combat the enemies satisfactorily with decreasing expenditures. Many cities and towns once badly infested are at present, through State aid, in good condition, and now should become self-supporting, and it is the department's purpose to so direct the work that the annual drain upon the State treasury may be lessened as much as possible.

Massachusetts has been the motive force in combating these pests up to the present. In recent years the insects have spread into adjoining States, where little attention to their control has been given, so that now the problem is one of protecting the nation.

It is believed that the national government can ill afford to take other than a more progressive stand in this work. A million dollars a year at present will go farther than a much greater sum later on. It is reasonable to hope that parasites, diseases or natural causes may work to the detriment of these insects, but there are many chances of other sections of the country becoming infested and thereby working great destruction before results from these are realized. At present the only practical means of protection from the spread of this pest is through spraying and other well-known mechanical methods.

The various phases of the State Forester's activities are given more fully under their respective classifications in this report.

ORGANIZATION.

There have been a number of changes during the year, but the department is fortunate in having intact the same general staff of assistants as last year.

Mr. A. T. Speare, moth disease work, resigned, and Mr. R. M. Colley of Harvard University has succeeded him. Mr. William Reiff, assistant to Professor Wheeler of the Bussey Institute, and who has given the moth disease work part time, has arranged to give the department his whole time for a season. Mr. Charles W. Minot and Mr. Frank A. Bates, who have been connected with the State work for many years as agents, now known as district superintendents, have resigned.

The changes in local forest wardens and moth superintendents in towns and cities have been very few indeed, and this fact results in more satisfactory conditions.

Mr. William W. Colton, division superintendent No. 6, resigned to become city forester of Fitchburg.

The legislation creating a State Fire Warden and establishing look-out stations and a patrol system increases the organization to that extent.

In securing the services of Mr. M. C. Hutchins as State Fire Warden, I am convinced Massachusetts is particularly fortunate. Mr. Hutchins has been in the employ of the New York forest service for seven years, and had charge of one of the most important forest fire divisions of the Adirondacks. He began his services for Massachusetts on August 1, and already the organization is well perfected. We may have every reason to believe that by another season the forest fire menace will be greatly reduced. A report of the fire work will be explained more fully under that title.

The organization of the State Forester's department at present is as follows:—

GENERAL STAFF.

F. W. RANE, B.Agr., M.S., . . .	State Forester.
H. O. COOK, M.F., . . .	Assistant Forester.
L. H. WORTHLEY, . . .	Assistant, moth work.
R. S. LANGDELL, . . .	Assistant, reforestation.
M. C. HUTCHINS, . . .	State Fire Warden.
H. F. GOULD, M.F., . . .	Assistant, forestry management.
F. F. MOON, M.F., . . .	Assistant, Massachusetts Agricultural College.
WILLIAM REIFF, . . .	Assistant, moth disease work.
R. H. COLLEY, . . .	Assistant, moth disease work.
CHARLES O. BAILEY, . . .	Secretary.
ELIZABETH HUBBARD, . . .	Clerk, bookkeeper.
CHARLOTTE JACOBS, . . .	Clerk, mail and office.
EMILIE RAU, . . .	Stenographer.
JOSEPHA L. GALLAGHER, . . .	Clerk.
JOHN LANERGAN, . . .	Office boy.

CO-OPERATIVE SCIENTIFIC STAFF.

L. O. HOWARD, Ph.D., . . .	Chief United States Bureau of Entomology, Washington, D. C., parasites and predaceous insects.
THEOBALD SMITH, Ph.B., M.D., . . .	Professor of Comparative Pathology, Harvard University, diseases of insects.
ROLAND THAXTER, Ph.D., . . .	Professor of Cryptogamic Botany, Harvard University, fungous diseases affecting insects.
W. M. WHEELER, Ph.D., . . .	Professor of Entomology, Harvard University, experimental entomologist.

STAFF, FOREST FIRE PROTECTION.

F. W. RANE, M.S.,	.	.	.	State Forester.
M. C. HUTCHINS,	.	.	.	State Fire Warden.
M. E. FENN,	.	.	.	Assistant.
F. L. HAYNES,	.	.	.	District Forest Warden No. 1.
J. J. SHEPHERD,	.	.	.	District Forest Warden No. 2.
JOHN P. CROWE,	.	.	.	District Forest Warden No. 3.
G. H. ALLEN,	.	.	.	District Forest Warden No. 4.
JOHN MURDOCH, Jr.,	.	.	.	District Forest Warden No. 5.

Observers and Observation Stations.

J. F. HAMMOND,	.	.	.	Robbin's Hill, Chelmsford.
F. H. LOMBARD,	.	.	.	Grace Mountain, Warwick.
HERBERT MORRISSEY,	.	.	.	Plymouth.
—	.	.	.	Shoot Flying Hill, Barnstable.
G. W. SHERMAN,	.	.	.	Steerage Rock, Brimfield.
G. C. MILLER,	.	.	.	Mount Tom, Holyoke.
N. C. WOODWARD,	.	.	.	Massamet Mountain, Shelburne Falls.
J. H. ALLEN,	.	.	.	Wachusett Mountain, Princeton.
L. A. WELLS,	.	.	.	Blue Hills, Hyde Park.

STAFF, MOTH WORK.

F. W. RANE, M.S.,	.	.	.	State Forester.
L. H. WORTHLEY,	.	.	.	Assistant (General Superintendent).
SMITH, GEORGE A.,	Superintendent,	District 1,	92 Sagamore Avenue,	Chelsea.
ENWRIGHT, JOHN W.,	Superintendent,	District 2,	48 Fellsway,	Medford.
HATCH, WILLIAM A.,	Superintendent,	District 3,	174 Main Street,	Hudson.
RAMSEY, HARRY B.,	Superintendent,	District 4,	217 Park Avenue,	Worcester.
WORTHEN, FRANCIS C.,	Superintendent,	District 5,	Central Street,	Georgetown.
FITZGERALD, JOHN J.,	Superintendent,	District 6,	50 Howard Street,	Haverhill.
PHILLIPS, SAUL,	Superintendent,	District 7,	P. O. Box 1363,	Beverly.
PARKHURST, CLARENCE W.,	Superintendent,	District 8,	P. O. Box 472,	Medfield.
HODGKINS, LEWIS W.,	Superintendent,	District 9,	North Raynham.	
FARLEY, JOHN A.,	Superintendent,	District 10,	Plymouth, R. F. D.	
CARLETON, JOHN F.,	Superintendent,	District 11,	East Sandwich.	

Inspectors.

ARMSTRONG, HENRY F.	SANDS, GEORGE A.
HOLMES, WALTER F.	SILVA, JOSEPH.
MERRICK, JOHN L.	SWEENEY, CHARLES F.
YOUNG, ARTHUR W.	

Mechanics.

HALPIN, FREDERICK P.	TOWLE, CLAUDE E.
PERRY, CHARLES H.	SMITH, ALBERT E.
WRIGHT, HARVEY J.	

LEAROYD, FRANCIS V., in charge, Supply Store.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS.

[Alphabetically by Towns and Cities.]

Badge No.	Telephone Number.	Forest Warden.	City or Town.	Local Moth Superintendent.	Dist. No.
287	No telephone,	B. E. Wilkes, ¹	Abington,	C. F. Shaw,	10
181	No telephone,	W. H. Kingsley,	Acton,	J. O'Neil,	3
275	2003-M,	H. F. Taber,	Acushnet,	A. P. R. Gilmore,	9
7	48-2,	J. Clancy,	Adams,	- -	-
93	3165-11,	E. M. Hitchcock,	Agawam,	- -	-
24	151-32, Great Barrington.	J. H. Wilcox, P. O. State Line.	Alford,	- -	-
228	-	J. E. Feltham,	Amesbury,	A. L. Stover,	5
67	343-5,	A. F. Bardwell,	Amherst,	W. H. Smith,	4
212	105-3,	J. H. Playdon, ²	Andover,	J. H. Playdon,	6
193	35,	W. H. Pierce, ¹	Arlington,	W. H. Bradley,	2
104	5-6,	C. A. Billings,	Ashburnham,	C. A. Billings,	3
158	-	W. S. Green,	Ashby,	H. A. Lawrence,	3
50	4-12,	C. A. Hall,	Ashfield,	- -	-
200	146-L, South Framingham	H. H. Piper,	Ashland,	M. Geoghan,	8
105	44-2 or 72-4,	F. P. Hall, ¹	Athol,	W. S. Penniman,	4
265	34-4,	H. R. Packard, ¹	Attleborough,	W. E. S. Smith,	8
123	5-17,	J. F. Searle,	Auburn,	J. F. Searle,	4
259	8072-4,	J. W. McCarty,	Avon,	W. W. Beals,	8
169	96-4 or 477-4,	C. E. Perrin,	Ayer,	D. W. Mason,	3
315	236-2,	H. C. Bacon, P. O. Hyannis.	Barnstable,	H. C. Bodfish,	10
142	8-4,	A. E. Traver,	Barre,	G. R. Simonds,	4
23	3-12,	E. D. Ballou,	Becket,	- -	-
179	No telephone,	C. E. Williams,	Bedford,	W. A. Cutler,	2
73	10,	J. A. Peeso,	Belchertown,	E. C. Howard,	4
326	157-2, Milford,	J. A. Spencer,	Bellingham,	H. A. Whitney,	8
194	409-W,	J. F. Leonard, ¹	Belmont,	C. H. Houlahan,	1
271	No telephone,	G. H. Babbitt, Taun- ton, R. F. D., 1.	Berkley,	J. M. Alexander,	9
139	14-6,	W. Cole,	Berlin,	E. C. Ross,	3
39	2-13,	E. W. Hale,	Bernardston,	- -	-
220	168-12,	R. H. Grant, ¹	Beverly,	J. B. Brown,	7
173	22-2,	E. N. Bartlett, ¹	Billerica,	W. H. O'Brien,	6
114	475-L-1, Woon- socket.	T. Reilly,	Blackstone,	A. J. Gibbons,	8
81	10-3,	H. K. Herrick,	Blandford,	- -	-
146	7-22,	C. E. Mace,	Bolton,	C. E. Mace,	3
-	-	-	Boston,	D. H. Sullivan,	1

¹ Also chief of fire department.² Also tree warden.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

Badge No.	Telephone Number.	Forest Warden.	City or Town.	Local Moth Superintendent.	Dist. No.
311	-	S. O. Phinney, P. O. Monument Beach.	Bourne, . .	S. B. Wright, .	11
182	11-4, W. Acton,	M. L. Wetherbee, .	Boxborough, .	C. E. Sherry, .	3
218	-	H. L. Cole, George-town, R. F. D.	Boxford, . .	C. Perley, . .	5
138	16-5, . .	C. S. Knight, . .	Boylston, . .	E. H. Hastings, .	4
244	2125-4, . .	J. M. Cutting, South Braintree.	Braintree, . .	O. A. Hubbard, .	1
318	No telephone,	T. B. Tubman, . .	Brewster, . .	J. E. Eldridge, .	11
293	8-6, . .	E. S. Rhoades, . .	Bridgewater, .	A. W. McFarland, .	8
99	14-3, . .	G. E. Hitchcock, .	Brimfield, . .	G. E. Hitchcock, .	4
286	1041, . .	H. L. Marston, ¹ .	Brockton, . .	R. H. Carr, . .	8
120	105-3, . .	D. N. Hunter, . .	Brookfield, . .	J. H. Conant, . .	4
237	376, . .	G. H. Johnson, ¹ .	Brookline, . .	E. B. Dane, . .	1
49	Lampson & Goodnow Mfg. Co.	W. Sauer, P. O. Shelburne Falls.	Buckland, . .	- -	-
178	2-5, . .	W. W. Skelton, ² .	Burlington, . .	W. W. Skelton, .	2
249	21060, . .	L. Horton, P. O. Ponkapoag.	Canton, . .	A. Hemenway, . .	8
-	-	- -	Cambridge, . .	J. F. Donnelly, .	1
171	9166, . .	W. B. Chamberlain, .	Carlisle, . .	G. G. Wilkins, . .	2
304	16-2, . .	H. F. Atwood, . .	Carver, . .	H. F. Atwood, . .	10
42	No telephone,	F. D. Legate, . .	Charlemont, . .	- -	-
115	32-3, . .	C. Bond, . .	Charlton, . .	J. D. Fellows, . .	4
320	11-12, . .	G. W. Ryder, West Chatham.	Chatham, . .	G. B. Bassett, . .	11
172	1597-4, . .	A. C. Perham, . .	Chelmsford, . .	M. A. Bean, . .	6
-	-	- -	Chelsea, ³ . .	J. A. O'Brien, .	1
11	167-3, . .	C. D. Cummings, .	Cheshire, . .	- -	-
80	8-2, . .	M. E. Turner, . .	Chester, . .	- -	-
63	8004, . .	C. A. Bisbee, Bisbee,	Chesterfield, .	- -	-
87	271-11, . .	M. J. Lynch, . .	Chicopee, . .	- -	-
308	No telephone,	E. C. Mayhew, . .	Chilmark, . .	A. S. Tilton, . .	11
3	No telephone,	D. W. Blanchard, No. Adams, R. F. D., 1.	Clarksburg, . .	- -	-
145	138-L, . .	R. Jendricks, . .	Clinton, . .	J. B. Connery, .	3
246	177-3, . .	W. J. Brennock, . .	Cohasset, . .	J. E. Grassie, . .	1
37	17-6, . .	W. H. Davenport, .	Colrain, . .	- -	-
180	169-2 or 300, .	G. G. Morrell, ¹ . .	Concord, . .	H. P. Richardson, .	1
51	20-13, . .	C. Parsons, ² . .	Conway, . .	- -	-
60	8001, . .	W. S. Gabb, P. O. Swift River.	Cummington, .	- -	-
14	58-11, . .	A. K. Cleveland, .	Dalton, . .	- -	-
147	No telephone,	T. L. Thayer, North Dana.	Dana, . .	T. L. Thayer, . .	4

¹ Also chief of fire department.² Also tree warden.³ No forest area.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

Badge No.	Telephone Number.	Forest Warden.	City or Town.	Local Moth Superintendent.	Dist. No.
345	277-3, . . .	M. H. Barry, . . .	Danvers, . . .	T. E. Tinsley, . .	7
278	1383-41, New Bedford.	S. P. Hawes, . . .	Dartmouth, . . .	- -	-
241	373 or 31-6, . .	H. J. Harrigan, . .	Dedham, . . .	J. T. Kennedy, . .	8
52	273-14, Green,	W. L. Harris, . . .	Deerfield, . . .	- -	-
317	No telephone,	A. P. Baker, South Dennis.	Dennis, . . .	H. H. Sears, . . .	11
272	29-3, . . .	Ralph Earle, . . .	Dighton, . . .	D. F. Lane, . . .	10
112	East Douglas, Central.	W. L. Church, . . .	Douglas, . . .	W. E. Carpenter, .	4
240	373-1, . . .	J. Breagy, . . .	Dover, . . .	H. L. McKenzie, . .	8
163	1869-4, . . .	F. H. Gunther, ¹ Navy Yard.	Dracut, . . .	T. F. Carrick, . .	1
110	152-2, . . .	F. A. Putnam, . . .	Dudley, . . .	I. H. Easterbrook, .	4
161	No telephone,	A. W. Swallow, . .	Dunstable, . . .	W. Saville, . . .	6
303	22-2, . . .	E. W. Soule, P. O. Box 15, Millbrook.	Duxbury, . . .	H. A. Fish, . . .	10
298	146-5, . . .	R. H. Copeland, P. O. Elmwood.	E. Bridgewater, .	B. F. Taylor, . . .	8
95	4-3, . . .	E. J. Speight, . . .	E. Longmeadow, .	- -	-
322	26-21, Orleans,	W. H. Nickerson, . .	Eastham, . . .	N. P. Clark, . . .	11
77	2-11, . . .	J. M. Deneen, . . .	Easthampton, . .	- -	-
264	24-7, North Easton.	J. Baldwin, ¹ . . .	Easton, . . .	R. W. Melendy, . .	8
346	241-2, . . .	M. S. Roberts, . . .	Edgartown, . . .	T. S. Wimpenny, . .	8
29	165-14, Great Barrington.	F. W. Bradford, Great Barrington, R.F.D.	Egremont, . . .	- -	-
74	1-13, . . .	H. L. Ryther, . . .	Enfield, . . .	- -	-
46	No telephone,	C. H. Holmes, Farley,	Erving, . . .	- -	-
233	No telephone,	O. O. Storey, ² . . .	Essex, . . .	O. O. Story, . . .	7
-	-	-	Everett, ³ . . .	J. Davidson, . . .	2
276	1439-22, . . .	A. C. Aiken, . . .	Fairhaven, . . .	G. W. King, . . .	9
280	14, . . .	W. Mulligan, . . .	Fall River, . . .	J. H. Nugent, . . .	9
312	136-2, . . .	H. N. Lawrence, P. O. Teaticket.	Falmouth, . . .	W. B. Bosworth, . .	11
157	1421-W or 745,	W. W. Colton, . . .	Fitchburg, . . .	W. W. Colton, . . .	3
5	Hoosac Tunnel Pay Station.	H. B. Brown, P. O. Drury.	Florida, . . .	- -	-
261	37-11, . . .	E. A. White, ¹ . . .	Foxborough, . . .	S. J. Johnston, . .	8
197	352-4, South Framingham	B. P. Winch, . . .	Framingham, . .	N. I. Bowditch, . .	8
255	67-3, . . .	E. S. Cook, . . .	Franklin, . . .	J. W. Stobbsart, . .	8
274	No telephone,	A. Hathaway, Assonet,	Freetown, . . .	G. M. Nichols, . .	11
153	191-M, . . .	G. S. Hodgman, . .	Gardner, . . .	T. W. Danforth, . .	4
343	-	L. B. Smalley, P. O. Menemsha.	Gay Head, . . .	J. W. Belain, . . .	11
224	4-2, . . .	C. J. Eaton, . . .	Georgetown, . . .	C. J. Eaton, . . .	5
45	4-15, . . .	L. C. Munn, . . .	Gill, . . .	A. Tuttle, . . .	4

¹ Also chief of fire department.² Also tree warden.³ No forest area.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS—*Con.*

Badge No.	Telephone Number.	Forest Warden.	City or Town.	Local Moth Superintendent.	Dist. No.
234	547-5, . .	S. F. Haskell, . .	Gloucester, . .	H. J. Worth, . .	7
61	18-4, . .	J. S. Mollison, P. O. Williamsburg.	Goshen, . .	- -	-
344	-	-	Gosnold, . .	- -	-
125	Central, . .	S. F. Leonard, . .	Grafton, . .	C. K. Despeau, . .	4
79	55-4, . .	C. N. Rust, . .	Granby, . .	- -	-
91	4-12, . .	L. N. Henry, . .	Granville, . .	- -	-
25	5-3, . .	D. W. Flynn, . .	Gt. Barrington, . .	- -	-
44	443-2, . .	J. W. Bragg, . .	Greenfield, . .	J. W. Bragg, . .	4
327	33-24, . .	W. H. Walker, Greenwich Village.	Greenwich, . .	- -	-
167	105, . .	J. B. Harrington, ¹ . .	Groton, . .	J. F. Bateman, . .	2
225	1026-X, . .	S. E. Johnson, . .	Groveland, . .	R. B. Larive, . .	5
66	651-33, Northampton.	E. P. West, ² . .	Hadley, . .	- -	-
299	-	E. H. Vaughn, . .	Halifax, . .	F. D. Lyon, . .	10
222	No telephone,	F. Berry, Essex, R. F. D.	Hamilton, . .	E. G. Brewer, . .	7
97	6-5, . .	J. S. Swenson, . .	Hampden, . .	- -	-
9	Post-office, . .	C. F. Tucker, . .	Hancock, . .	- -	-
295	8011-2, . .	C. E. Damon, Box 113, No. Hanover.	Hanover, . .	L. Russell, . .	10
296	8012-6, Bryantville.	A. L. Dame, ² South Hanson.	Hanson, . .	A. L. Dame, . .	10
141	No telephone,	P. J. Humphrey, . .	Hardwick, . .	P. J. Humphrey, . .	4
152	46-3, . .	B. J. Priest, . .	Harvard, . .	G. C. Maynard, . .	3
319	Central, . .	J. Condon, . .	Harwich, . .	- -	-
65	6-3, . .	J. M. Strong, West Hatfield.	Hatfield, . .	- -	-
216	4-2, . .	J. B. Gordon, ¹ . .	Haverhill, . .	M. Fitzgerald, . .	6
48	121-3, . .	M. H. White, P. O. Charlemont.	Hawley, . .	- -	-
36	5-18, . .	S. G. Benson, . .	Heath, . .	- -	-
289	21305, . .	G. Cushing, ¹ . .	Hingham, . .	T. L. Murphy, . .	1
15	20, . .	L. B. Brague, . .	Hinsdale, . .	- -	-
247	150, Randolph,	E. W. Austin, ¹ . .	Holbrook, . .	W. Hayden, . .	8
136	29-4, . .	W. H. Stearns, P. O. Jefferson.	Holden, . .	W. H. Stearns, . .	4
101	5-21, . .	O. L. Howlett, Southbridge, R. F. D.	Holland, . .	- -	-
202	1-2, . .	W. A. Collins, . .	Holliston, . .	G. H. Moody, . .	8
85	R. H. Dietz, . .	C. J. Haley, . .	Holyoke, . .	- -	-
328	233-2, . .	W. F. Durgin, . .	Hopedale, . .	W. F. Durgin, . .	8
201	Central, . .	R. I. Frail, . .	Hopkinton, . .	W. McMillan, . .	8
149	25-13, . .	E. A. Young, ² . .	Hubbardston, . .	E. A. Young, . .	4
199	No telephone,	F. W. Trowbridge, ¹ . .	Hudson, . .	F. P. Hosmer, . .	8

¹ Also chief of fire department.² Also tree warden.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

Badge No.	Telephone Number.	Forest Warden.	City or Town.	Local Moth Superintendent.	Dist. No.
329	248-W., . .	S. F. Sturges, ² P. O. Allerton.	Hull,	J. Knowles, . .	1
70	-	D. B. Mack, . . .	Huntington, . .	- -	-
330	28 or 156, . .	J. H. Wetherbee, . .	Hyde Park, . .	E. I. Corbett, . .	1
223	42-6 or 100, . .	A. J. Barton, . . .	Ipswich,	J. Morey, . . .	5
301	-	A. B. Holmes, . . .	Kingston, . . .	R. F. Randall, . .	10
283	261-2, . . .	N. F. Washburn, P. O. Middleborough.	Lakeville, . . .	S. T. Nelson, . .	9
151	152-3, Clinton,	E. M. Hawkins, . .	Lancaster, . . .	L. R. Griswold, . .	3
10	717-5, Pittsfield.	K. D. Keeler, . . .	Lanesborough, . .	- -	-
214	24-M, . . .	H. Roach,	Lawrence, . . .	H. Roach, . . .	6
22	66-5, . . .	J. W. Bossidy, . . .	Lee,	- -	-
122	No telephone,	C. White, P. O. Cherry Valley.	Leicester, . . .	J. H. Woodhead, . .	4
18	135, . . .	O. R. Hutchinson, ¹ .	Lenox,	M. O'Brien, . .	4
155	546 or 9, . .	F. A. Russell, . . .	Leominster, . . .	S. R. Walker, . .	3
57	No telephone,	O. C. Marvel, North Leverett.	Leverett, . . .	- -	-
188	No telephone,	A. P. Howe, . . .	Lexington, . . .	A. P. Howe, . . .	2
38	248-11, . . .	J. Sauter,	Leyden,	- -	-
187	56-5, . . .	J. J. Kelliher, Concord, R. F. D.	Lincoln,	J. J. Kelliher, . .	1
170	17-4, . . .	A. E. Hopkins, . . .	Littleton, . . .	A. E. Hopkins, . .	3
94	1233-2, . . .	O. C. Pomeroy, . .	Longmeadow, . .	- -	-
165	201-21, . . .	E. S. Hosmer, ¹ . .	Lowell,	C. A. Whittet, . .	6
88	17-13, . . .	E. E. Chapman, . .	Ludlow,	- -	-
156	24-2 L, . . .	M. E. Harvey, . . .	Lunenburg, . . .	M. E. Harvey, . .	3
331	1174, . . .	H. C. Bayrd, . . .	Lynn,	G. H. McPhetres, .	1
209	No telephone,	T. E. Cox, Wakefield, R. F. D.	Lynnfield, . . .	L. P. Twiss, . . .	2
191	108, . . .	F. Turner,	Malden,	Street commissioners.	-
236	-	E. J. Seamans, . . .	Manchester, . . .	J. D. Morrison, . .	7
263	1-2, . . .	H. E. King,	Mansfield, . . .	W. O. Sweet, . . .	8
332	No telephone,	W. H. Stevens, . . .	Marblehead, . . .	W. H. Stevens, . .	1
306	117-2, . . .	G. B. Nye,	Marion,	J. Allanack, . . .	11
198	345-2, . . .	E. C. Minehan, ¹ . .	Marlborough, . .	T. J. Brennan, . .	3
292	43-3, . . .	W. G. Ford,	Marshfield, . . .	P. R. Livermore, .	10
313	19-11 or 19-4, Cotuit.	J. A. Peters, . . .	Mashpee,	W. F. Hammond, .	11
281	25-2, . . .	E. C. Stetson, . . .	Mattapoissett, .	A. H. Dexter, . . .	9
184	No telephone,	A. J. Coughlan, . . .	Maynard,	A. Coughlan, . . .	3
252	106-4, . . .	W. E. Kingsbury, ¹ .	Medfield,	G. L. L. Allen, . .	8
192	138 or 53, . .	C. E. Bacon, ¹ . . .	Medford,	W. J. Gannon, . .	1
254	15-2 or 38-3, .	C. C. Hunt,	Medway,	F. Hager,	8

¹ Also chief of fire department.² Also tree warden.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

Badge No.	Telephone Number.	Forest Warden.	City or Town.	Local Moth Superintendent.	Dist. No.
-	-	-	Melrose, . .	J. J. McCullough, .	2
118	151-4, . .	E. L. Cook, . .	Mendon, . .	F. M. Aldrich, . .	8
227	21-3, . .	E. P. Sargent, . .	Merrimac, . .	C. R. Ford, . .	5
213	No telephone,	H. Nichols, . .	Methuen, . .	A. H. Wagland, . .	6
284	5 or 36, . .	C. E. Weston, . .	Middleborough, .	F. L. White, . .	9
342	9024-14, . .	T. H. Flemming, P. O. Bancroft.	Middlefield, . .	- -	-
211	-	O. H. Sheldon, . .	Middleton, . .	B. T. McGlaulin, .	5
127	65-3, . .	E. M. Crockett, ¹ .	Milford, . .	P. Fitzgerald, . .	8
124	42-13, . .	W. Blany, . .	Millbury, . .	E. F. Roach, . .	4
253	5-2, . .	C. La Croix, . .	Millis, . .	E. W. Stafford, . .	8
242	322, . .	N. T. Kidder, ² . .	Milton, . .	N. T. Kidder, . .	1
34	No telephone,	S. R. Tower, . .	Monroe, . .	- -	-
98	12-22, . .	O. E. Bradway, . .	Monson, . .	- -	-
53	289-14, Green- field.	F. T. Lyman, . .	Montague, . .	- -	-
28	Post-office, .	D. C. Tryon, . .	Monterey, . .	- -	-
30	No telephone,	R. I. Patterson, .	Mt. Washington,	- -	-
-	138, . .	T. Roland, . .	Nahant, ³ . .	T. Roland, . .	1
333	16-21, . .	G. M. Winslow, . .	Nantucket, . .	G. M. Winslow, . .	11
204	52-4, . .	W. E. Daniels, . .	Natick, . .	H. S. Hunnewell, .	1
238	195-1, . .	H. H. Upham, ¹ . .	Needham, . .	E. E. Riley, . .	1
6	No telephone,	C. S. Baker, . .	New Ashford, . .	- -	-
277	2280, . .	E. F. Dahill, ¹ . .	New Bedford, . .	C. F. Lawton, . .	9
131	31-15, North Brookfield.	E. L. Havens, . .	New Braintree, .	E. L. Havens, . .	4
32	Post-office, .	J. McLaughlin, . .	N. Marlborough,	- -	-
55	Pay station, .	R. King, Cooleyville,	New Salem, . .	R. King, . .	4
231	173-1, New- buryport.	W. P. Bailey, Byfield,	Newbury, . .	H. L. Bailey, . .	5
230	380, . .	C. P. Kelley, . .	Newburyport, . .	C. P. Kelley, . .	5
205	N. W., 33-1, .	W. B. Randlett, ¹ New- ton Center.	Newton, . .	C. I. Bucknam, . .	1
256	Post-office, .	A. R. Jones, . .	Norfolk, . .	A. R. Jones, . .	8
4	205-4, . .	H. J. Montgomery, ¹ .	North Adams, . .	H. E. Blake, . .	4
215	821-3, . .	G. A. Rea, . .	North Andover, .	P. Holt, . .	6
262	17-2, . .	H. W. Tufts, . .	N. Attleborough,	F. P. Toner, . .	8
129	26-14, . .	G. O. Rollins, ¹ . .	N. Brookfield, . .	S. D. Colburn, . .	4
175	12-6, . .	H. Upton, ¹ . .	North Reading, .	G. E. Eaton, . .	2
72	165, . .	F. E. Chase, Engine House.	Northampton, .	- -	-
140	14-5, . .	T. P. Haskell, . .	Northborough, .	T. P. Haskell, . .	4

¹ Also chief of fire department.² Also tree warden.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

Badge No.	Telephone Number.	Forest Warden.	City or Town.	Local Moth Superintendent.	Dist. No.
117	71-5, Whitinsville.	W. E. Burnap, P. O. Whitinsville.	Northbridge, .	- -	-
40	2-3, . . .	F. W. Doane, . . .	Northfield, . . .	F. W. Doane, . . .	4
266	No telephone,	G. H. Storer, . . .	Norton, . . .	G. H. Storer, . . .	8
290	11-4, . . .	J. Whalen, . . .	Norwell, . . .	J. H. Sparrell, . . .	10
250	-	J. Fred Boyden, . . .	Norwood, . . .	F. H. Winslow, . . .	8
334	119-4, Marthas Vineyard.	F. W. Chase, . . .	Oak Bluffs, . . .	P. P. Hurley, . . .	11
135	17-5, . . .	C. H. Trowbridge, . . .	Oakham, . . .	C. H. Trowbridge, . . .	4
47	62-13, . . .	F. M. Jennison, . . .	Orange, . . .	F. M. Jennison, . . .	4
321	21-12, . . .	C. F. Poor, . . .	Orleans, . . .	A. Smith, . . .	11
27	7-15, . . .	J. B. Soule, East Otis,	Otis, . . .	- -	-
335	25-2, . . .	C. A. Rich, . . .	Oxford, . . .	C. G. Larned, . . .	4
89	65-11 or 53-12,	J. Summers, ¹ . . .	Palmer, . . .	C. H. Keith, . . .	4
130	881-14, Worcester.	D. W. Gratan, . . .	Paxton, . . .	F. L. Durgin, . . .	4
219	18-3, . . .	M. V. McCarthy, . . .	Peabody, . . .	J. F. Callahan, . . .	2
68	318-2, . . .	G. P. Shaw, Amherst, R. F. D.	Pelham, . . .	- -	-
294	8029-2, Bryantville.	J. J. Shepard, . . .	Pembroke, . . .	J. J. McFarlen, . . .	10
160	54-3 or 12-5, . . .	G. G. Tarbell, East Pepperell.	Pepperell, . . .	J. Tune, . . .	2
16	1-2, . . .	E. Shumway, . . .	Peru, . . .	- -	-
148	13-2, . . .	G. P. Marsh, ² . . .	Petersham, . . .	F. A. Hathaway, . . .	4
106	176-6, Athol, . . .	W. Coulbeck, Athol, R. F. D., 3.	Phillipston, . . .	W. H. Coulbeck, . . .	4
13	149 or 964, . . .	W. C. Shepard, ¹ . . .	Pittsfield, . . .	- -	-
309	18-31, Cum- ming.	E. L. Parker, . . .	Plainfield, . . .	- -	-
59	208-L, No. Attleborough.	H. E. Coombs, ¹ . . .	Plainville, . . .	C. N. Snell, . . .	8
302	197-W or 88-4,	H. Morissey, . . .	Plymouth, . . .	A. A. Raymond, . . .	10
300	11-14, King- ston.	T. W. Blanchard, . . .	Plympton, . . .	D. Bricknell, . . .	10
69	11-4, . . .	W. H. Pierce, P. O. Greenwich Village.	Prescott, . . .	- -	-
150	13-4, . . .	F. W. Bryant, . . .	Princeton, . . .	F. A. Skinner, . . .	4
325	49-11, . . .	J. H. Barnett, . . .	Provincetown, . . .	J. M. Burch, . . .	-
243	-	P. J. Williams, ¹ . . .	Quincy, . . .	A. J. Stewart, . . .	1
248	86-1, . . .	C. A. Wales, ¹ . . .	Randolph, . . .	J. E. Blanche, . . .	8
270	1284-R, . . .	J. V. Festing, . . .	Raynham, . . .	G. M. Leach, . . .	9
176	214-1, . . .	H. E. McIntire, . . .	Reading, . . .	H. M. Donegan, . . .	2
268	11-12, . . .	B. F. Monroe, Attleborough, R. F. D.	Rehoboth, . . .	S. W. Robinson, . . .	9
-	-	-	Revere, ³ . . .	G. P. Babson, . . .	1
17	4-2, . . .	T. B. Salmon, . . .	Richmond, . . .	- -	-
282	No telephone,	D. E. Hartley, P. O. Mattapoisett.	Rochester, . . .	G. W. Wilcox, . . .	11
288	55-4, . . .	J. H. Burke, . . .	Rockland, . . .	F. H. Shaw, . . .	10

¹ Also chief of fire department.² Also tree warden.³ No forest area.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS—*Con.*

Badge No.	Telephone Number.	Forest Warden.	City or Town.	Local Moth Superintendent.	Dist. No.
235	27-3, . . .	A. J. McFarland, . .	Rockport, . . .	F. A. Babcock, . .	7
35	21-6, . . .	M. A. Peck, P. O. Zoar,	Rowe, . . .	- -	-
232	No telephone,	D. O'Brien, . . .	Rowley, . . .	D. O'Brien, . .	5
102	No telephone,	L. G. Forbes, . . .	Royalston, . . .	A. H. Brown, . .	4
83	194, Spring- field.	S. S. Shurtleff, . .	Russell, . . .	- -	-
143	13-3, . . .	H. Converse, ¹ . . .	Rutland, . . .	H. E. Wheeler, . .	4
-	-	- -	Salem, ³ . . .	A. Stillman, . .	7
229	-	C. I. Dow, . . .	Salisbury, . . .	H. C. Rich, . .	5
33	Post-office, .	L. H. Clark, P. O. New Boston.	Sandisfield, . .	- -	-
314	-	J. F. Carlton, P. O. Spring Hill.	Sandwich, . . .	B. F. Denison, . .	11
207	144-2, . . .	O. C. Christiansen, .	Saugus, . . .	T. E. Berrett, . .	2
8	3-3, . . .	H. H. Fitzroy, . . .	Savoy, . . .	- -	-
291	129-3, . . .	E. R. Seaverns, ¹ North Scituate.	Scituate, . . .	P. S. Brown, . .	1
267	399-L-5, Paw- tucket.	J. L. Baker, Attlebor- ough, R. F. D., 4.	Seekonk, . . .	H. L. Thompson, .	9
257	121-2, . . .	A. A. Carpenter, . .	Sharon, . . .	T. J. Leary, . .	8
31	24-2, . . .	A. H. Tuttle, . . .	Sheffield, . . .	- -	-
43	135-4, . . .	H. O. Fiske, Shelburne Falls.	Shelburne, . . .	- -	-
203	-	M. F. Campbell, So. Sherborn.	Sherborn, . . .	J. P. Dowse, . .	8
348	9-6, . . .	G. F. Buxton, . . .	Shirley, . . .	A. A. Adams, . .	3
132	Central, . . .	W. E. Rice, . . .	Shrewsbury, . .	F. L. Ott, . . .	4
58	2-21 Highland Tel. Co.	M. A. Haskell, . . .	Shutesbury, . .	- -	-
336	No telephone,	W. F. Griffiths, Swan- sea, R. F. D.	Somerset, . . .	C. Riley, . . .	9
-	-	- -	Somerville, ³ . .	A. B. Pritchard, .	1
78	724-1, Holyoke,	L. H. Lamb, South Hadley Falls.	So. Hadley, . .	- -	-
76	151-22, . . .	G. W. Tyler, . . .	Southampton, .	- -	-
337	13, Marlbor- ough.	H. Burnett, ² . . .	Southborough, .	H. Burnett, . .	4
109	11, . . .	A. Langevin, . . .	Southbridge, . .	A. Langevin, . .	4
92	14-5, . . .	L. G. Mason, . . .	Southwick, . . .	- -	-
121	77-4, . . .	A. F. Howlett, . . .	Spencer, . . .	G. Ramer, . . .	4
86	20, Indian Or- chard.	T. J. Clifford, P. O. Indian Orchard.	Springfield, . .	W. F. Gale, . . .	4
144	16-5, . . .	G. F. Herbert, P. O. Pratts Junction.	Sterling, . . .	J. H. Kilburn, . .	3
21	Post-office, .	G. Schneyer, P. O. Glendale.	Stockbridge, . .	Dr. H. C. Haven, .	4
190	207-R, . . .	L. T. Bruce, . . .	Stoneham, . . .	G. M. Jefts, . . .	2
258	121-3, . . .	J. Curley, . . .	Stoughton, . . .	W. P. Kennedy, . .	8
183	145-11, . . .	W. H. Parker, P. O. Gleasondale.	Stow, . . .	G. A. Patterson, .	3
108	No telephone,	C. M. Clark, P. O. Fiskedale.	Sturbridge, . . .	C. M. Clark, . . .	4
185	5-5, . . .	S. W. Hall, So. Sud- bury.	Sudbury, . . .	W. E. Baldwin, . .	3

¹ Also chief of fire department.² Also tree warden.³ No forest area.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

Badge No.	Telephone Number.	Forest Warden.	City or Town.	Local Moth Superintendent.	Dist. No.
338	46, . . .	A. C. Warner, . . .	Sunderland, . . .	- -	-
116	56-5, Millbury,	R. H. Richardson, .	Sutton, . . .	J. E. Gifford, . .	4
339	3106-3, . . .	G. P. Cahoon, ¹ . .	Swampscott, . . .	E. P. Mudge, . . .	1
273	-	T. L. Mason, . . .	Swansea, . . .	A. E. Arnold, . . .	9
269	320 or 1-3, . .	F. A. Leonard, ¹ . .	Taunton, . . .	A. Harnden, . . .	9
107	37-16, . . .	H. A. Seaver, . . .	Templeton, . . .	J. B. Wheeler, . .	4
164	11-3, . . .	H. W. Pillsbury, . .	Tewksbury, . . .	H. M. Briggs, . . .	6
310	102-3, . . .	E. C. Chadwick, P. O. Vineyard Haven.	Tisbury, . . .	P. S. Luce, . . .	11
90	-	C. H. Deming, . . .	Tolland, . . .	- -	-
218	Central, . . .	C. W. Floyd, . . .	Topsfield, . . .	C. W. Floyd, . . .	5
159	11-2 or 37-2, .	F. J. Piper, ¹ . . .	Townsend, . . .	G. E. King, . . .	2
324	No telephone,	N. Hatch, . . .	Truro, . . .	J. H. Atwood, . .	11
162	6-4, . . .	O. L. Wright, . . .	Tyngsborough, . .	C. Allgrove, . . .	6
26	1-22, . . .	G. F. Knapp, . . .	Tyringham, . . .	- -	-
126	7-2, . . .	E. M. Baker, ¹ . . .	Upton, . . .	G. H. Evans, . . .	8
113	31-12, . . .	L. F. Rawson, . . .	Uxbridge, . . .	H. C. Newell, . .	8
208	-	S. T. Parker, . . .	Wakefield, . . .	W. W. Whittredge,	2
100	No telephone,	W. W. Eager, . . .	Wales, . . .	- -	-
340	112-2, . . .	H. A. Spear, Jr., . .	Walpole, . . .	P. R. Allen, . . .	8
195	Post-office, . .	G. L. Johnson, ¹ . .	Waltham, . . .	W. M. Ryan, . . .	1
75	5-13, . . .	L. S. Charbonneau, .	Ware, . . .	F. Zeissig, . . .	4
305	45-23, . . .	D. C. Keyes, . . .	Wareham, . . .	J. J. Walsh, . . .	11
119	No telephone,	D. Vigneaux, . . .	Warren, . . .	A. A. Warriner, . .	4
41	73-3, . . .	C. A. Williams, . . .	Warwick, . . .	E. E. Batchelder, .	4
19	34-6, Becket, .	C. B. Saunders, . . .	Washington, . . .	- -	-
206	116, Newton North.	J. C. Ford, . . .	Watertown, . . .	J. C. Ford, . . .	1
196	56-4, Natick, .	C. S. Williams, P. O. Cochituate.	Wayland, . . .	D. J. Graham, . . .	1
111	113-4, . . .	T. Toomey, . . .	Webster, . . .	C. Klebart, . . .	4
239	250, . . .	W. W. Diehl, . . .	Wellesley, . . .	F. M. Abbott, . . .	1
323	No telephone,	E. P. Cook, . . .	Wellfleet, . . .	E. S. Jacobs, . . .	11
54	74-14, Orange,	G. A. Lewis, . . .	Wendell, . . .	- -	-
221	74-2, . . .	J. D. Barnes, ² . . .	Wenham, . . .	J. D. Barnes, . . .	7
137	4-12, . . .	F. H. Baldwin, . . .	West Boylston, . .	C. H. Baldwin, . .	4
285	768, . . .	W. P. Laughton, . .	W. Bridgewater, .	O. Belmore, . . .	8
128	No telephone,	J. H. Webb, . . .	W. Brookfield, . .	J. H. Webb, . . .	4
226	No telephone,	S. M. Titecomb, P. O. Byfield.	W. Newbury, . . .	W. H. Preble, . . .	5
341	691-12, . . .	A. A. Sibley, . . .	W. Springfield, . .	J. F. Hayes, . . .	8

¹ Also chief of fire department.² Also tree warden.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

Badge No.	Telephone Number.	Forest Warden.	City or Town.	Local Moth Superintendent.	Dist. No.
20	Post-office, .	B. Manning, . .	W. Stockbridge, .	- -	-
307	203-23, . .	W. J. Rotch, . .	West Tisbury, .	H. W. Athearn, .	11
133	No telephone,	J. H. McDonald, ¹ .	Westborough, .	J. P. Crowe, .	4
84	111-Y, . .	T. H. Mahoney, .	Westfield, . .	- -	-
166	14-3, . .	J. A. Healey, P. O. Graniteville.	Westford, . .	H. L. Nesmith, .	2
71	148-13, . .	L. Burt, . .	Westhampton, .	- -	-
154	15-22, . .	J. C. Goodridge, .	Westminster, .	S. Whitney, .	4
186	512-2, Wal- tham.	E. P. Ripley, . .	Weston, . .	E. P. Ripley, .	1
279	No telephone,	H. A. Sanford, . .	Westport, . .	H. A. Sanford, .	9
251	336-M, Ded- ham.	P. R. Dean, . .	Westwood, . .	C. H. Southerland,	8
245	332-M, . .	J. L. Hunt, ¹ . .	Weymouth, . .	C. L. Merritt, .	1
56	69-2, South Deerfield.	J. A. Wood, East Whately.	Whately, . .	- -	-
297	28-14, . .	C. A. Randall, ² .	Whitman, . .	C. A. Randall, .	10
96	1-4, . .	H. I. Edson, North Wilbraham.	Wilbraham, .	J. H. Starr, .	4
64	37-21, . .	F. J. Vining, P. O. Haydenville.	Williamsburg, .	- -	-
2	184-14, . .	A. Remillard, . .	Williamstown, .	- -	-
174	34-4, . .	H. M. Horton, . .	Wilmington, .	O. A. McGrane, .	2
103	147-5, . .	A. L. Brown, ¹ . .	Winchendon, .	G. W. Drury, .	4
189	123-2, . .	D. H. DeCarney, ¹ .	Winchester, .	S. S. Symmes, .	2
12	203-12, Dalton,	C. D. Galusha, . .	Windsor, . .	- -	-
-	-	- -	Winthrop, ³ .	J. A. Barry, .	1
177	110, . .	F. E. Tracy, ¹ . .	Woburn, . .	J. H. Kelley, .	2
131	1947, . .	A. V. Parker, . .	Worcester, . .	H. J. Neale, .	4
62	10-13, . .	C. F. Bates, . .	Worthington, .	- -	-
260	21-3, . .	E. S. Stone, . .	Wrentham, . .	W. M. Gilmore, .	8
316	53-21, . .	D. Nickerson, . .	Yarmouth, . .	C. R. Bassett, .	11

¹ Also chief of fire department.² Also tree warden.³ No forest area.

PART I.

GENERAL FORESTRY.

PART I.

GENERAL FORESTRY.

EXAMINATIONS OF WOODLAND.

Our custom, continued now for several years, of giving first place under "general forestry" to an account of examinations of woodland belonging to private owners, seems again to be justified by a slight increase over last year, both numerically and in area, of unsolicited examinations of this character, thus keeping this branch of our work well to the front in importance.

Not only has this increase taken place, but, what is still more gratifying, the proportion of examinees who are actually following or are on the point of taking up the recommendations of the office has surpassed that of last year by nearly 10 per cent. An increase of this kind is much more gratifying than would be the increase in number of examinations alone. The total area of land examined exceeds last year's figures by nearly 2,000 acres.

Owing to this increase, as well as to the additional amount of land surveyed and mapped, no systematic attempt has been made to pursue the work of inspecting former examinations, in accordance with the hope expressed last year. Several such inspections have been made in the regular course of the work, however, as will appear below.

The following tables give lists of the examinations and inspections made, their location and area. A table of costs will be found at the end of this section of the report.

OWNER.	Town.	Area (Acres).
Affleck, G. B.,	Russell,	30
Bay State Street Railway Company, .	Methuen,	43
Bay State Street Railway Company, .	Tyngsborough,	118
Bennett, Marion,	Tyngsborough,	200
Bird, C. S.,	East Walpole,	20
Breague, Dr.,	Foxborough,	5
Brown, Wm. B.,	Blackinton,	400
Bullard,	Holliston,	100
Clark, H. W.,	Andover,	55
Clinton water department,	Sterling,	211
Crocker, C. T.,	Fitchburg and Westminster, . . .	500
Cutting, Mattie B.,	Sudbury,	50
Dennison, H. S.,	Framingham,	20
Fogg, H. T.,	Nowell,	40
Foxborough State Hospital,	Foxborough,	1,000
Greenfield Woman's Club,	Greenfield,	52
Hale, R. W.,	Dover,	180
Hardy, F. O.,	Ashburnham,	200
Hellier, C. E.,	Marion,	20
Hollaway, G. W.,	Abington,	18
Holliston school board,	Holliston,	10
Hosmer, E. H.,	Carlisle,	190
Hunt, D.,	Marshfield,	150
Hutchins, G.,	Concord,	6
Leland, P. F.,	Ashland,	14
Maynard & Edgerly,	Stow,	30
Metropolitan Water Board,	Southborough, Framingham, Marl- borough,	1,400
Milford, town of,	Milford,	8
Mixer, S. J.,	Hardwick,	250
Mixer, S. J.,	Barre,	101
Mount Tom Golf Club,	Holyoke,	20
New Bedford water works,	Lakeville, Freetown, Rochester, .	1,500
Newburyport water board,	Newburyport,	50
New Salem Academy,	New Salem,	102
Norwell, town of,	Norwell,	10
Owen, G. W.,	Peabody,	8
Pabodie, W.,	Walpole,	40
Pearce, A. C.,	Lexington,	8
Perkins, H. S.,	Ipswich,	50
Plumb, C. S.,	Becket,	465

OWNER.	Town.	Area (Acres).
Pousland, F. G.,	Carlisle,	70
Powell, E. C.,	Wilbraham,	50
Reed, J. O.,	Townsend,	95
Ripley, A. L.,	Andover,	10
Sibley, F. P.,	Hingham,	62
Stannard, Margaret,	Andover,	40
Stevens estate,	Warwick,	50
Vesper Club,	Tyngsborough,	90
Wakefield park board,	Wakefield,	8
Washburn, C. G.,	Princeton,	6
Watertown Arsenal,	Watertown,	2
Wharton, W. F.,	Groton,	10
White, A. P.,	Danvers,	30
Y. P. C. U. of Lynn,	Lynnfield,	7
Total,		8,202

Ten inspections have been made, totalling 880 acres.

OWNER.	Town.	Area (Acres).
Bay State Street Railway Company, .	Groveland,	38
Bennett, Marion,	Tyngsborough,	200
Fitchburg water board,	Westminster,	400
Fogg, H. T.,	Norwell,	40
Goldsbury, P. S.,	Warwick,	50
Joslin, E. P.,	Oxford,	100
Kilburn, W. G.,	Lancaster,	7
Leland, P. F.,	Ashland,	14
Mahoney, T. J.,	Wareham,	1
Sears, Julia M.,	Tyngsborough,	30
Total,		880

Chestnut Bark Disease.

In addition to the regular examinations of woodland described above, several examinations have been made by this office to ascertain the presence or absence of the chestnut bark disease, *Diaporthe (Valsonectria) parasitica*.

A list of examinations follows: —

OWNER.	Town.	Area (Acres).	Disease present.
Helburn, J. W.,	West Stockbridge,	160	No.
Hoffman, Bernard,	Stockbridge,	Nursery stock	No.
Moses, A. H.,	Russell,	1,200	Yes.
Pearson, S. F.,	Alford,	50	Yes.
Shatswell, H. K.,	Dedham,	30	No.
Woodruff, C.,	West Stockbridge,	75	No.

These examinations were made with the knowledge and usually at the request of the owner.

During the coming year this work will be energetically pushed, and in fact at this writing two assistants from this office are in the field investigating the geographical extent of the infestation, following up the work of Mr. A. H. Graves of the United States forest service (outlined more fully in another section of this report), but with particular reference to discovering and investigating all possible means of utilizing the wood of trees killed by the disease, *e.g.*, the comparatively recent process of obtaining chestnut extract from both bark and wood.

WOODLAND MANAGEMENT.

Some space in our last annual report was devoted to an account of an operation in Buckland, Mass., where a good bit of merchantable timber was taken out and the stand still left in good growing shape, the ground being well covered in most cases with white pine seed trees. Where such seed trees were not left, under planting with two-year seedlings was tried.

The success of this operation has made us feel justified in undertaking the general supervision of a similar work in Barre, described fully below.

SURVEYING.

The forestry department has done more surveying and accompanying mapping this year than ever before. The work of obtaining complete files of maps for all lots taken over under the so-called reforestation act is being carried to completion. During the past year an area of 485 acres has been thus surveyed, comprising the following lots:—



A natural stand of white pine properly thinned to assure good growth of the remaining trees. In the town of Buckland.



A plantation of white pine, thirty-eight years of age, which has been thinned by this office at a profit, belonging to W. G. Killburn of Lancaster.

NAME OF LOT.	Town.	Area (Acres).
Baker-Dune,	Wellfleet,	18
Bolton,	Shirley,	20
Crowell,	Yarmouth,	21
French,	Lancaster,	74
Holmes,	Kingston,	14
Holway,	Sandwich,	24
Glebe land,	Hopkinton,	108
Jacobs,	Wellfleet,	6
Jones River,	Kingston,	140
Nickerson,	Harwich,	15
Clark,	Paxton,	45
Total, . . . . .	. . . . .	485

Other lots surveyed bring the total area up to 643 acres, for all of which maps have been made by the forestry department.

FOREST MAPS.

Besides maps of this sort, two complete maps in colors have been made. One of these, a map of the Barre property above referred to, comprises an area of 101 acres, and outlines the various types of tree growth, forming a basis for an estimate of the timber and a working plan for carrying on the operation of the property.

Before this map was drawn a so-called preliminary examination was made to ascertain the approximate amount of timber and the chances of getting it out, accompanied by a report recommending that certain steps be taken toward ascertaining the facts more accurately, and particularly in regard to the making of the map in question.

This report being accepted and its suggestions adopted, several days were spent in an accurate survey of the ground and in plotting the areas of the different types of growth as closely as possible. The map when finished was made the basis of a fuller report, containing the volume to be removed by cutting and an estimate of the gross and net profits.

The pine was found to total about 1,750,000 feet board measure, of which some 750,000 feet will be cut. Of the 245,000 feet of hardwood, about 153,000 feet will be cut. Besides the above

there is on the property about 54,000 feet of hemlock, so that it will be evident that a fair-sized timber operation is under way, and one which will illustrate, we hope, the advantages of a scientific method of cutting, — a statement which becomes particularly forcible when it is added that a probable net profit of about \$7,000 will be realized and the stand left in better growing shape at the conclusion of the work than it was in the beginning.

The operation of this lot is now in progress and the work is nearing completion, a large number of the logs being yarded and ready for the mill. This office hopes in the near future to publish a bulletin describing in some detail this operation, and several others recently handled in much the same way.

The other map referred to combines an outline survey with timber and topographic map in colors, and, like the above, is accompanied by an estimate. The property is owned by Prof. C. S. Plumb of Columbus, O., and consists of 450 acres of land in Becket, Mass., most of which is growing some kind of timber. Mr. Plumb has become much interested in the property, and we hope by judicious forestry management to eventually establish a good working forest proposition. To this end the owner expects to turn over 10 acres of the open land, and probably more eventually, for forest planting. This will supply the immediate need for young growth, and if continued at intervals will provide constantly growing timber of different ages. About all the other stages of growth are now represented by timber on the ground, although the proportions vary greatly, as is to be expected in any natural stand.

If our plans are followed, however, instead of eventually being obliged to cut practically all the timber and leave the ground bare, by the time the present medium growth is mature there will be a fine stand of much better quality coming on.

Thus the ideal of all forest management will be approached, viz., a continuous, periodical, sustained yield, without diminution of the capital stock of timber.

All the maps referred to have been preserved in duplicate for our files by means of tracings, thus doubling the work but greatly increasing the usefulness of the maps.

EXAMINATION WORK.

An account of the expenses of the examination work is given herewith, in accordance with section 6, chapter 409, Acts of 1904, as amended by section 2, chapter 473, Acts of 1907.

EXPENSES INCURRED IN EXAMINATION WORK, CHARGED TO OWNERS.

Affleck, G. B.,	\$5 22	Milford, town of,	- 1
Bay State Street Railway Company, .	2 80	Mixer, S. J.,	8 96
Bennett, Marion,	1 40	Mount Tom Golf Club,	4 77
Bird, C. S.,	- 1	New Bedford water works,	4 00
Breague, Dr.,	1 50	Newburyport,	2 00
Brown, A. W. F.,	2 04	New Salem,	4 42
Brown, Wm. B.,	3 21	Norwell, town of,	- 1
Bullard,	- 1	Owen, G. W.,	1 00
Clark, H. W.,	1 04	Pabodie, W.,	80
Clinton water department,	1 83	Pearce, A. C.,	40
Crocker, C. T.,	2 28	Perkins, H. S.,	1 30
Cutting, Mattie B.,	50	Plumb, C. S.,	10 25
Dennison, H. S.,	1 10	Pousland, F. G.,	-
Fogg, H. T.,	1 20	Powell, E. C.,	4 01
Foxborough State Hospital,	- 1	Reed, J. O.,	- 1
Greenfield Woman's Club,	4 84	Ripley, A. L.,	1 04
Hale, R. W.,	75	Sibley, F. P.,	- 2
Hardy, F. O.,	2 00	Stannard, Margaret,	1 04
Hellier, C. E.,	4 60	Stevens estate,	6 54
Holloway, G. W.,	80	Vesper Club,	1 30
Holliston school board,	1 60	Wakefield park board,	75
Hosmer, E. H.,	95	Washburn, C. G.,	2 00
Hunt, Daniel,	3 30	Watertown Arsenal,	- 1
Hutchins, G.,	- 1	Wharton, W. F.,	- 1
Leland, P. F.,	3 00	White, A. P.,	90
Maynard & Edgerly,	94	Y. P. C. U. of Lynn,	- 1
Metropolitan Water Board,	1 00		

REFORESTATION WORK.

The reforestation work has been carried on this year along the same lines as formerly, and the increasing interest of lumbermen and landowners proves it a policy worthy of enlargement.

The plantations put in during the spring of 1909 and 1910 are showing up well, the growth in many instances on plantations made with transplant white pine being as much as 8 to 16 inches this last season. There was practically no loss this year from dry weather affecting these plantations, proving that when once well started they are not liable to be affected by climatic conditions.

Plantations made this year in one or two instances were quite badly affected by the exceedingly dry season, as might be expected.

Increased interest has been shown by parties looking over

¹ No expense.² Transportation furnished.

plantations with the idea of making small plantings on their own land, and the large number of inquiries shows that this work is awakening great interest.

This year 860 acres have been planted, and deeds for 500 acres additional have been recorded which, from lack of sufficient appropriations, we were unable to plant. There are also now offered 700 acres more. The amount of work possible is governed entirely by the appropriation, and it would seem advisable for the State to enlarge this work.

FOREST NURSERY.

It has been impossible up to the present time to raise sufficient stock to take care of the planting done under the reforestation act, the department being forced to purchase a large number of seedlings from outside nurserymen at a much higher price than if raised on our own land. It has, therefore, been deemed advisable to enlarge our nursery from time to time, and we are now in a position to supply from our own nursery sufficient stock for our planting work next spring.

It being impossible to obtain land suitable for transplant work adjoining our present site at Amherst, it was deemed advisable to make this nursery the main one, raising seedlings and doing as much transplant work as the allotment of land would allow; to establish at Hopkinton a transplant nursery, and also to enlarge our nursery at Sandwich, where for the past two years we have been raising Scotch and Austrian pine, black locust and such varieties as are suitable for planting on Cape land.

Under this system we shall be able to ship direct from the nearest nursery to the planting site and in this way avoid much expense and delay in transportation.

The Amherst nursery has been in charge of our foreman, W. N. Tavener, the past season and was very capably managed. The exceedingly dry weather has not seemed to affect either last year's seedling or the transplant beds. This year's seedlings were affected, however, by the drought, though a fairly dense stand has been obtained. This year's transplants have made a remarkably good showing, and the work was much facilitated by the use of planting boards designed by one of the men at the nursery, this board enabling a man to put in a much larger number of trees and leave them firmer in the rows than when the old method was used.

At Hopkinton about an acre of land was ploughed up and made into transplant beds, and set with Norway spruce and white pine seedlings. This nursery has needed very little care except for two or three light weedings. It should be enlarged the coming spring.

At East Sandwich a good stand of Scotch pine was obtained, but the loss by drought of this year's seeding of white pine shows the inadvisability of trying to raise this variety from seed in that section, unless an irrigation system can be installed, which would be well worth the outlay both at the Sandwich nursery and at Amherst.

We shall have from these nurseries about 500,000 transplants and 350,000 three-year seedlings for field use this year, and with our two-year-old stock shall be able to take care of our entire planting work without purchasing elsewhere.

PLANTING DONE UNDER THE ADVICE OF THIS OFFICE.

NAME.	Town.	Variety.	Number of Trees.
F. C. Bent,	Sudbury,	White pine, . . .	15,000
E. H. Brennan,	North Salem,	White pine, . . .	1,000
H. S. Dennison,	South Framingham,	White pine, . . .	5,000
T. M. Cole,	North Carver,	White pine, . . .	3,000
F. C. Dunn,	Gardner,	White pine, . . .	25,000
C. O. Flagg,	Gilbertville,	White pine, . . .	5,000
Fitchburg Water Company,	Fitchburg,	White pine, . . .	20,000
F. J. Tucker,	West Rutland,	White pine, . . .	1,000
O. J. Stockwell,	Athol,	White pine, . . .	3,000
B. D. Pierce,	Springfield,	White pine, . . .	1,000
Island Park Box Company,	Bradford,	White pine, . . .	1,000
L. C. Grosvenor,	Taunton,	White pine, . . .	2,000
P. B. Hart,	Medway,	White pine, . . .	6,000
C. W. Severance,	Bernardston,	White pine, . . .	1,000
E. L. Sampson,	Plymouth,	White pine, . . .	1,000
G. H. Simonde,	North Andover,	White pine, . . .	1,000
Danvers State Hospital,	Danvers,	White pine, . . .	2,000
R. B. Symington,	Plymouth,	White pine, . . .	40,000
C. F. Choate,	Petersham,	White pine, . . .	20,000
I. P. Lawrence,	Fitchburg,	White pine, . . .	56,000
Miss C. B. Dobson,	Ipswich,	White pine, . . .	1,500
Miss C. B. Dobson,	Ipswich,	Norway spruce, . .	500

PLANTING DONE UNDER THE ADVICE OF THIS OFFICE—*Con.*

NAME.	Town.	Variety.	Number of Trees.
Lewis A. Wright,	Gardner,	White pine, . .	500
S. W. McCaslin,	Wellfleet,	White pine, . .	100
Town of Norwell,	Norwell,	White pine, . .	2,000
H. T. Fogg,	Norwell,	Miscellaneous, .	7,000
Watertown Arsenal, . . .	Watertown,	White pine, . .	2,000
Fall River water board, . .	Fall River,	White pine, . .	4,000

AMHERST NURSERY.

VARIETY.	Age (Years).	Number of Trees.
White pine seedlings,	1	2,000,000
White pine seedlings,	2	2,000,000
White pine seedlings,	3	450,000
Norway spruce seedlings,	1	500,000
Norway spruce seedlings,	2	1,000,000
White ash seedlings,	1	50,000
Catalpa speciosa seedlings,	2	500
Chestnut seedlings,	1	2,000
Maple seedlings,	2	500
Total,		6,003,000
White pine transplants,	4	250,000
White pine transplants,	3	325,000
Norway spruce transplants,	4	24,000
Red pine transplants,	3	14,942
Fir balsam transplants,	3	20,553
Hemlock transplants,	3	2,542
Arbovitæ transplants,	3	6,634
Total,		643,671

HOPKINTON NURSERY.

Norway spruce transplants,	3	125,000
White pine transplants,	3	125,000
Total,		250,000

SANDWICH NURSERY.

VARIETY.	Age (Years).	Number of Trees.
Catalpa speciosa seedlings,	2	4,600
Black locust seedlings,	2	6,800
Black locust seedlings,	1	15,000
Honey locust seedlings,	2	5,000
Pitch pine seedlings,	1	30,000
Pitch pine seedlings,	2	100,000
Pitch pine seedlings,	3	130,000
Scotch pine seedlings,	1	30,000
Scotch pine seedlings,	2	100,000
Austrian pine seedlings,	1	20,000
Austrian pine seedlings,	3	1,000
Black locust transplants,	3	40,000
Total,		482,400

STATE PLANTATIONS, 1911.

Town.	Acres.	Type of Land.	Variety planted.
Ashburnham, . . .	54	Cut-over land, . . .	White pine.
Ashburnham, . . .	94	Run-out pasture land, .	Norway spruce, white pine.
Ashburnham, . . .	14	Sprout land, . . .	White pine.
Hubbardston, . . .	40	Cut-over land, . . .	White pine.
Hubbardston, . . .	34	Cut-over land, . . .	White pine.
Ashburnham, . . .	63	Cut-over land, . . .	Norway spruce, white pine.
Fitchburg, . . .	27	Cut-over land, . . .	White pine.
Paxton, . . .	45	Cut-over land, . . .	Norway spruce, white pine.
Shirley, . . .	19½	Run-out pasture land, .	White pine.
Kingston, . . .	140	Burnt-over land, . . .	Norway spruce, white pine, black locust, etc.
Lancaster, . . .	74	Burnt-over land, . . .	White pine.
Greenfield, . . .	4	Open land, . . .	White pine.
Lancaster, . . .	8½	Burnt-over land, . . .	White pine.
Buckland, . . .	166	Run-out pasture land, .	White pine.
Buckland, . . .	11½	Cut-over land, . . .	White pine.
Attleborough, . . .	21½	Cut-over land, . . .	White pine.
Yarmouth, . . .	21	Burnt-over land, . . .	White pine.
Harwich, . . .	15	Burnt-over land, . . .	White pine.
Sandwich, . . .	10	Cut-over land, . . .	Scotch pine.
	860		

REPORT OF THE STATE FIRE WARDEN.

Mr. F. W. RANE, *State Forester*.

SIR:— In compliance with your request for a brief outline of the forest fire organization and the work accomplished during my four months' administration of this branch of the department, together with a statement of the work done during the preceding months of this year, I beg to submit the following :—

By an act of the last Legislature \$10,000 was appropriated for the prevention of forest fires. Under this act you were authorized to engage a State Fire Warden and necessary district forest wardens; also to adopt such other methods as would further protect the large area of timbered and forest lands within this Commonwealth.

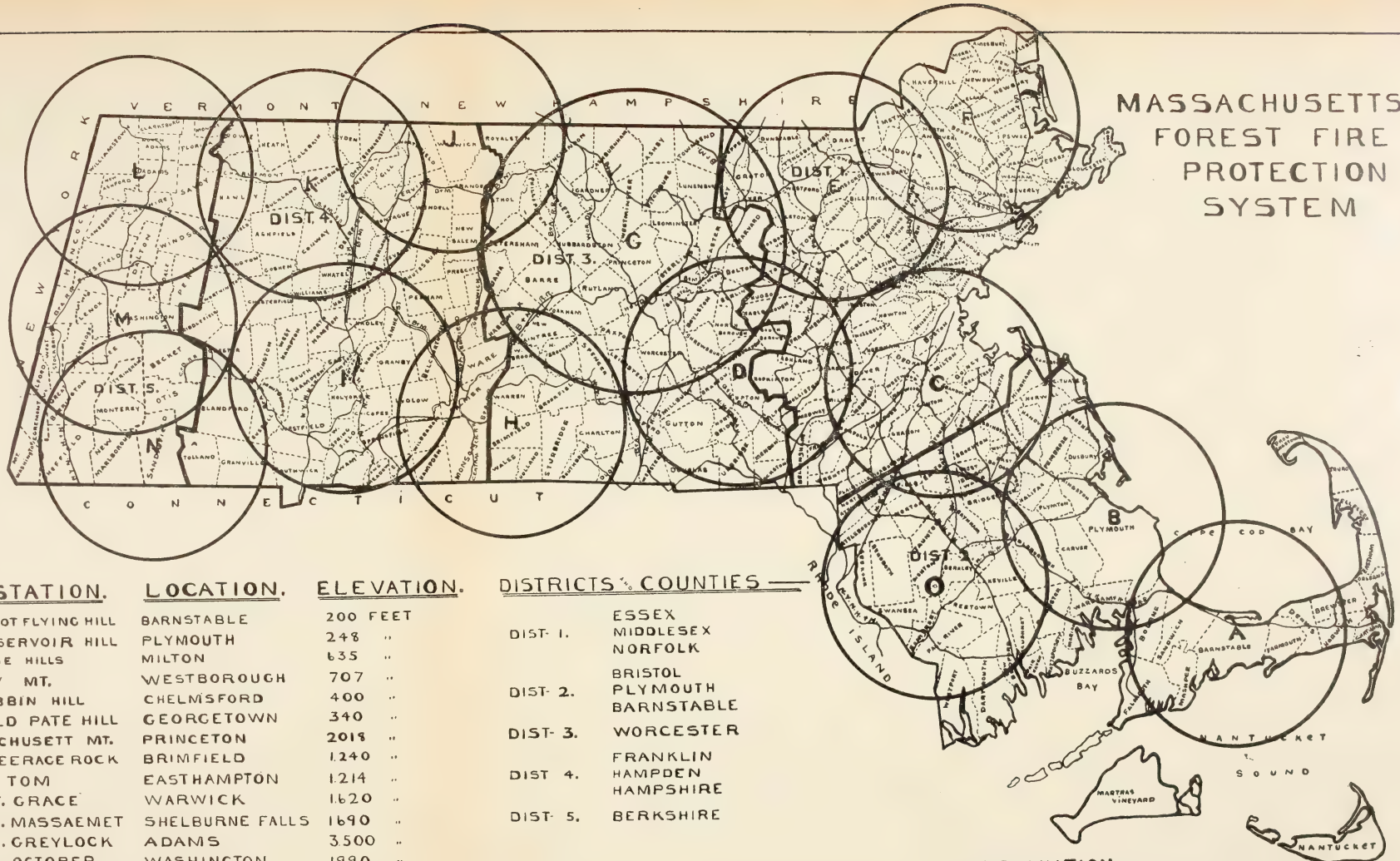
The first work under this branch was the division of the State into five forest fire districts, each district being placed under the supervision of a competent district forest warden. The district arrangements are as follows: No. 1, Essex, Middlesex and Norfolk counties; No. 2, Bristol, Barnstable and Plymouth counties; No. 3, Worcester County; No. 4, Franklin, Hampden and Hampshire counties; No. 5, Berkshire County. The principal work of the district forest wardens has been in assisting in erecting telephone lines and observation stations, map making, visiting the selectmen and forest wardens in each town, and showing them the importance of appointing deputy forest wardens, and having them distributed advantageously in the outlying timbered districts of the town. The district forest wardens are to visit each town within their respective districts, and impress upon the selectmen and wardens the importance of purchasing forest fire equipment; also, in towns with a valuation of \$1,500,000 or less, the necessity of taking advantage of the reimbursement act. A large number of towns coming under this act have already made application for the required blanks, and others, where funds are not available at the present time, will see that an article is placed in the warrant at the annual town meeting for the same.

Each district forest warden has under his personal supervision practically 1,000,000 acres, 70 per cent. of which is forest land. He has also supervision over three observation stations in his district covering this area.

We have established and have in operation 10 observation stations, each station covering practically 525,000 acres, or a radius of 15 miles. The length of time they have been in operation varies from two weeks to three months. As fast as completed they have been placed in operation.

District No. 1.— We have in this district two stations in operation, one of which is Blue Hill Observatory, Hyde Park, with an elevation of 635 feet, where we were able to secure the valuable services of the man already in charge. The use of the observatory has been tendered us without any compensation whatever, except the payment of the man in

MASSACHUSETTS FOREST FIRE PROTECTION SYSTEM



STATION.		LOCATION.	ELEVATION.	DISTRICTS. COUNTIES	
⊕	A. SHOOT FLYING HILL	BARNSTABLE	200 FEET	DIST. 1.	ESSEX
⊕	B. RESERVOIR HILL	PLYMOUTH	248 "		MIDDLESEX
⊕	C. BLUE HILLS	MILTON	635 "	DIST. 2.	NORFOLK
⊕	D. FAY MT.	WESTBOROUGH	707 "		BRISTOL
⊕	E. ROBBIN HILL	CHELMSFORD	400 "	DIST. 3.	PLYMOUTH
⊗	F. BALD PATE HILL	GEORGETOWN	340 "		BARNSTABLE
⊕	G. WACHUSETT MT.	PRINCETON	2013 "	DIST. 4.	WORCESTER
⊕	H. STEERAGE ROCK	BRIMFIELD	1240 "		FRANKLIN
⊕	I. MT. TOM	EASTHAMPTON	1214 "	DIST. 5.	HAMPDEN
⊕	J. MT. GRACE	WARWICK	1620 "		HAMPSHIRE
⊕	K. MT. MASSAEMET	SHELBURNE FALLS	1690 "		BERKSHIRE
⊕	L. MT. GREYLOCK	ADAMS	3500 "		
⊗	M. MT. OCTOBER	WASHINGTON	1990 "		
⊗	N. TOWN HILL	SANDISFIELD	1760 "		
⊗	O. RICHMOND HILL	DIGHTON	200 "		

EXPLANATION

- ⊕ STATIONS IN OPERATION IN 1911.
- ⊖ STATIONS TO BE COMPLETED IN SPRING OF 1912.
- ⊗ STATION SITES PROPOSED.

charge for the time actually employed on our work. This station was placed in operation September 1 and discontinued November 10. This covers the Blue Hill Reservation and a large area of adjoining forest land in many towns.

We also have Robbin's Hill station in the town of Chelmsford, with an elevation of 400 feet, covering a large area of forest lands and protecting the watersheds of the Concord and Merrimac rivers. We were obliged to install telephone service here connecting with the New England Telephone Company at Chelmsford. We have also erected at this station a steel tower 40 feet high, with an observatory at the top. This station was placed in operation October 16 and discontinued November 10. In order to completely cover this district we are yet to establish a station in Essex County, in the vicinity of Bald Pate Mountain.

District No. 2. — In this district we have but one station in operation, Plymouth Observatory, which was placed at our disposal free of charge, we paying the observer for the time he is in charge of our work. This station covers a large tract of valuable forests, and was placed in operation September 11 and discontinued October 1.

We have also completed our telephone line on Shoot Flying Hill in Barnstable County, 200 feet elevation; but, owing to the rains and the lateness of the season, it was found unnecessary to place this in operation before spring. This station will cover a large portion of the Cape country. It will also be necessary to establish at least one more station in this district, and I think Richmond Hill in Dighton would be the most desirable selection, as it covers a large portion of Bristol County.

District No. 3. — We have in this district three stations in operation: Wachusett in Princeton, Fay in Westborough and Steerage Rock in Brimfield.

At Wachusett we were very fortunate in being allowed the free use of the observatory at the Summit House on Wachusett Mountain, with an elevation of 2,018 feet, and covering a radius of 20 miles, or an area of nearly 1,000,000 acres. From this station can be seen Boston harbor in the east and Greylock Mountain in the west. This station was the first to be placed in operation, August 14, and was discontinued November 10. Sixty-four fires have been observed and reported from this station alone. The watersheds of the Nashua, Miller, Chicopee, Thames and Blackstone rivers are protected by this station.

At Fay Mountain, with an elevation of 707 feet, we were obliged to install a telephone service connecting with the New England Telephone Company at Westborough. It will be necessary to erect a steel tower 40 feet high in order to completely cover the territory desired. The watershed of the Blackstone River and a large area of forest land are protected by this station, which was placed in operation October 8.

Steerage Rock, with an elevation of 1,240 feet, protects the watershed of the Connecticut and Thames rivers. At this station we were obliged to install a telephone service connecting with the New England

Telephone Company at Brimfield. Arrangements have been made for the erection of a 30-foot steel tower, with observation room at the top, from which this territory will be completely covered.

District No. 4. — In this district we have Mount Tom at Holyoke, Grace Mountain at Warwick and Massamet Mountain at Shelburne Falls. At Mount Tom we have also been extremely fortunate in being allowed the privilege of using the large observation room in the Summit House free of charge, where we have had at our command the use of 18 powerful telescopes. This station has an elevation of 1,214 feet and covers a large portion of Hampden and Hampshire counties, and also protects the watersheds of the Connecticut, Deerfield and Miller rivers.

Grace Mountain, with an elevation of 1,620 feet, protects the watersheds of the Connecticut, Deerfield and Miller rivers. At this station it was necessary to install a telephone system connecting with the New England Telephone Company at Warwick. We have also erected a 50-foot tower to completely cover the territory.

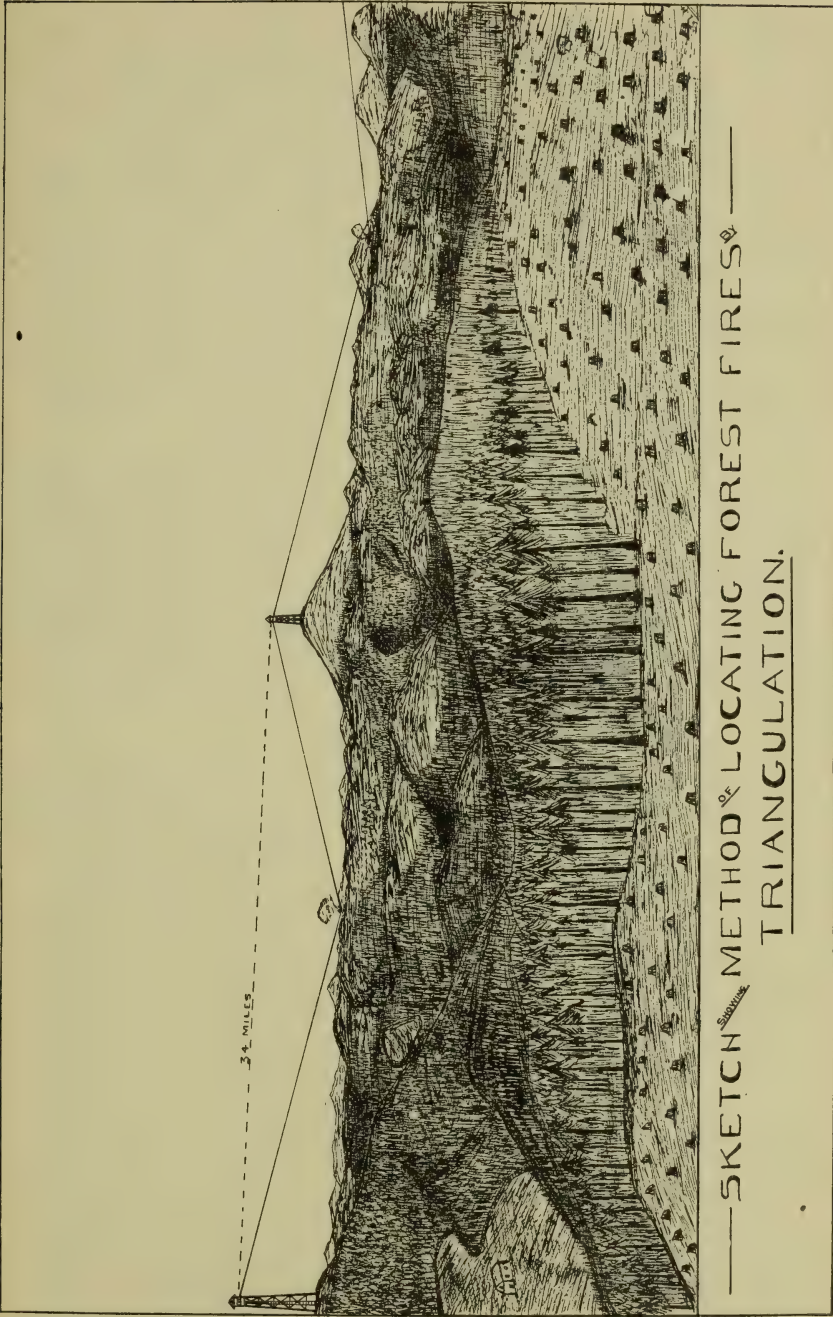
Massamet Mountain, with an elevation of 1,645 feet, covers a large portion of Franklin County and protects the watersheds of the Connecticut, Deerfield and Miller rivers. At this station we were donated the free use of the 63-foot stone tower, which completely covers the territory. It was necessary to install a telephone system on this mountain connecting with the Heath Telephone Company at Shelburne Falls. This station was placed in operation August 30 and was discontinued November 10.

District No. 5. — We have completed no permanent observation system in this district. An observer was placed on Greylock Mountain October 17, and his services were discontinued November 10. The principal reason for this was to determine the length of time this mountain was obscured by clouds. Owing to its elevation of 3,505 feet above sea level, the results were not perfectly satisfactory, but since it is a State reservation of 8,147 acres, and is already equipped with a telephone service and an iron tower 50 feet high, I feel that arrangements should be completed for the establishment of a permanent observation station at this point, to be placed in operation in the spring.

We have also had in view the advisability of establishing a station on October Mountain, but, owing to the delay in getting permission for the use of this mountain, it being a private preserve, we were unable to determine its value. We shall also establish a station in the southern part of Berkshire County, but nothing definite as to location has been arrived at as yet.

The above system, when completed, will cover practically every inch of the great Commonwealth of Massachusetts, from Cape Cod in the east to and including the Berkshire Hills in the west.

In explanation of our present system I wish to say that each observation station is in charge of a competent observer, a man thoroughly familiar with the territory surrounding his station. These men are equipped with



powerful glasses and maps of their respective territory. They also have telephone communication with over 1,500 town forest wardens and deputy town forest wardens. In connection with the new maps now being made for the season of 1912 we are installing our new triangulation system, which will be used in extreme cases where the observer is not sure as to the exact location of a fire. This system is not in general use, as far as known, in any other section of the country, Massachusetts being the first State to adopt it for forest fire purposes. By this method fires can be located more quickly and much more accurately than would otherwise be possible. An explanation of the system is shown in cut on page 39.

The steel towers with which we are now equipping a number of the observation stations have an observation room 8 feet by 8 feet, with glass enclosure as far as possible, thus allowing our watchman to be continually on the lookout and also be thoroughly protected from inclement weather. Within these rooms are maps, telephone, report blanks, etc.; also a time clock, showing the exact time the observers are on duty.

Owing to the short period our stations have been in operation, and the amount of rainfall during this time, our reports show only 200 fires observed, none of which burned over 3 acres. What the outcome would have been had the stations not been in operation of course we do not know, but if we are to base an estimate on our experience in the past, it would be no exaggeration to say that thousands of acres of valuable timber were saved, owing to the fact that the lookout stations make it possible for the fires to be detected and extinguished in their incipient stage.

FOREST FIRE EQUIPMENT.

The Legislature in the spring of 1910 passed an act authorizing the State Treasurer to reimburse towns having a valuation of \$1,500,000 or less 50 per cent. of whatever amount they might expend for forest fire equipment, providing this amount does not exceed \$500, and providing, also, that the equipment purchased has the approval of the State Forester. As the law was not passed until after the annual town meetings of that year, but 16 towns availed themselves of the opportunity, and only \$988.65 was expended, the amount expended by each town being very small during the year. The appropriation being continuous, the same amount was available again this year and 29 towns have taken advantage of the act, not only in purchasing small equipment, but several towns have practically used up their full allowance and purchased one of the wagons with full equipment. The amount expended this year to November 30, of which accounts have been received, is \$3,917.32, thus showing a very marked increase over last year.

I might add that this department holds receipts from the different town forest wardens for the equipment purchased under this act. The equipment is also subject to inspection by the State Fire Warden or by a district forest warden at any time. The following table contains the names of the towns that have received reimbursement, the amount thereof, and the kind of equipment purchased: —

TOWNS RECEIVING FIRE-EQUIPMENT REIMBURSEMENT.

TOWNS.	Amount of Reim- bursement.	Nature of Equipment.
Ashland,	\$43 27	Pumps, pails and extinguishers.
Bedford,	220 92	One-horse wagon complete.
Belchertown,	71 62	Wagon and equipment.
Bolton,	58 40	Extinguishers, pails and shovels.
Boxford,	45 60	Extinguishers.
Carlisle,	193 72	One-horse wagon complete.
Charlton,	221 37	Extinguishers, pails and shovels.
Chatham,	146 53	Wagon and equipment.
Dighton,	58 67	Extinguishers.
Erving,	11 52	Shovels and hoes.
Georgetown,	55 33	Extinguishers, shovels and rakes.
Greenwich,	25 95	Extinguishers.
Groveland,	51 05	Extinguishers, shovels and rakes.
Hadley,	75 00	Extinguishers.
Hanson,	250 00	Wagon, extinguishers, shovels, rakes.
Holbrook,	45 00	Extinguishers.
Lunenburg,	149 28	Extinguishers and shovels.
Mashpee,	34 55	Extinguishers and shovels.
Middleton,	49 50	Extinguishers.
Newbury,	18 15	Extinguishers.
Northborough,	102 37	Extinguishers.
North Reading,	134 43	Wagon and equipment.
Norwell,	50 00	Extinguishers.
Oakham,	138 00	Extinguishers.
Pelham,	40 62	Extinguishers and pumps.
Pembroke,	203 75	Wagon and equipment.
Phillipston,	48 65	Extinguishers.
Plainville,	178 50	Extinguishers.
Prescott,	48 16	Extinguishers.
Princeton,	249 20	Extinguishers and cans.
Raynham,	50 00	Extinguishers.
Royalston,	22 35	Extinguishers, shovels and pails.
Sandwich,	245 60	Wagon and equipment.
Shutesbury,	87 50	Extinguishers.
Sterling,	231 75	Wagon and equipment.
Sudbury,	250 00	Extinguishers.

TOWNS RECEIVING FIRE-EQUIPMENT REIMBURSEMENT — *Concluded.*

TOWNS.	Amount of Reimbursement.	Nature of Equipment.
Tewksbury,	\$174 00	Wagon and equipment.
Tyngsborough,	189 80	Pumps, extinguishers and shovels.
Upton,	133 53	Extinguishers.
Wendell,	35 07	Extinguishers, pails and shovels.
West Bridgewater,	200 12	Wagon and equipment.
Westminster,	55 91	Extinguishers, hoes, pails and shovels.
West Newbury,	33 75	Extinguishers.
Wilbraham,	136 31	Extinguishers.
Wilmington,	41 17	Extinguishers and shovels.

In this connection I wish to call your attention to our two sizes of model forest fire wagons. These were first constructed under the supervision of the State Forester in order that town officials might see what we consider an ideal form of apparatus. The larger wagon is intended for two horses, and costs, all equipped, about \$450, the equipment consisting of 14 chemical extinguishers; 14 galvanized cans, each holding two extra charges of water and chemicals; shovels; rakes; mattocks; and spare chemical charges. This equipment is carried in racks and cases, not only so that it will ride safely, but also so that it may be conveniently carried into the woods. Eight men can find accommodation on this wagon.

The smaller wagon, drawn by one horse, has all the equipment of the larger, but less in amount. It will carry 4 men, and costs, all equipped, about \$300.

The demand the past year having been so great, not only from Massachusetts but from adjoining States, several manufacturers are building forest fire wagons.

FIRE LINES.

A small part of the appropriation for fire work was used in the construction of fire lines, made primarily to protect some of the State plantations.

In Kingston this department had already commenced a fire line parallel to the Muddy Pond road at the westerly end of our plantation there, and this was continued for about a mile further to Muddy Pond. This road bisects the large area of burned-over country lying to the south of the town, and forms a very convenient place for fighting forest fires, so that this fire line is not only a protection to our plantation, but a great help to the town, which has agreed to keep the line in proper condition.

A fire line some 2,000 feet long was also constructed along one side of our plantation in Gardner, and a fire line surrounding a plantation in Templeton, which was made two years ago, was mowed over to clean up the brush that had grown up in the mean time. Altogether, about \$450 was invested in this work.

These fire lines were all of the same pattern. First a strip about 50 feet in width is cleared of brush, which is piled and burned, and on the inside a



ditch about 4 feet wide and 1 foot deep is dug. The theory is that the cleared portion will offer so little fuel for the fire that by the time it reaches the ditch it will be unable to cross.

FOREST FIRES OF 1911.

It is with considerable reluctance that each year we include in our annual report a chapter on this painful subject, — painful, because forest fires are the greatest obstacle to the advancement of practical forestry throughout this Commonwealth. As long as this State continues to burn over from 35,000 to 100,000 acres each year, just so long will forest owners hesitate to make provision for natural reproduction, to plant trees, to make improvement thinnings, or to do other work looking to continued forest production.

The season just ended has undoubtedly been the worst fire season this State has experienced in many years. When we stop and compare figures with the records of the past three years we find that during 1908, 1909 and 1910 there was burned over throughout this State 116,976 acres, with a damage of \$600,017, and in the year 1911 our reports show 99,693 acres burned over, with a damage of \$537,749, nearly as much as the three previous years combined. Estimating the forest area of the State at 2,500,000 acres, which is a very conservative estimate (and in order to

reach this amount there has been included all the scrub growth and old pastures), it will require only twenty-five years to completely destroy every acre of forest land within this State. Then what is the result? Simply this: not only are we compelled to go elsewhere for our timber supply, but we have created a condition which seriously threatens our future water supply, for it has been demonstrated by the greatest engineers in the world that forests play an important role in the regulation of rivers. They retain for some time the rainfall and lessen the violence of flood flow. Whenever forests have been destroyed stream flow has always become more irregular and floods have increased in number and violence. Therefore, is it not time the public were awakened and a more thorough organization perfected to avert these dangers?

In order that this department might have a better understanding as to the conditions throughout the State, the district forest wardens have visited as many towns as possible, and have submitted a written report to this office as to the conditions in each town, the type of man the warden is, and the facilities the towns have for fighting forest fires. These reports show the two extremes. Many towns have been fortunate in obtaining the services of a man for the position of forest warden who has had wide experience and training in handling forest fires, and have equipped themselves with modern fire-fighting apparatus, while other towns have forest wardens who are indifferent with regard to their duties, and who have taken no measures whatever to provide proper fire-fighting equipment. Therefore it remains very necessary that mayors and selectmen use more precaution in selecting these men, and as fast as the ideal man who has the energy and courage to make a thorough and efficient forest warden is found, have the appointment a permanent one so far as possible. We also desire to urge upon mayors and selectmen the importance of equipping the forest wardens with modern forest fire-fighting apparatus. Again, forest fire laws will never be respected unless enforced. Examples must be made of those who violate them, so that others will be restrained from negligence in the use of fire.

Forest Fire Reports.

Town forest wardens undoubtedly do not appreciate the importance of making a complete report to this department of each fire as soon as it is extinguished. The system of fire reports has been in use but a very short period, and while the results along this line have been fairly satisfactory, the reports have been misleading and not absolutely correct. The two important points in fire protection are, first, preventive methods and education; and second, effective fire fighting. The only way this department has of knowing whether we are completely covering these points is by its system of reports. If the reports show that we are not covering these two points, then we are in a position to suggest a preventive method; but understand this is an impossibility unless we have these reports as soon as the fire is extinguished. For instance, take the railroad fire situa-

tion. The reports that have come to this office this fall show that we have had 685 fires from this source during the summer, and yet the department was unable to have an inspection of the locomotives made and the cause of the fires remedied, owing to the lack of reports at the time of the fire. This is a very essential feature, and we shall be obliged to insist that these reports be forwarded promptly.

In studying the tables of causes of forest fires for the past three years we note some very interesting data, as well as substantial improvement along different lines. The "unknown" cause has the largest percentage, it being 44.5. This is owing, in a great measure, to insufficient care being taken to ascertain the exact cause. This we shall endeavor to remedy to a large extent the coming season. Railroad fires show a reduction of practically 2 per cent. over 1910 and nearly 8 per cent. over 1909, which is certainly an improvement, taking into consideration the extremely dry season. "Burning brush" fires have been reduced from 16.2 per cent. in 1910 to 5.3 per cent. this year. This is, in a large measure, due to the permit law enacted during the last Legislature, which is giving general satisfaction and should be made uniform throughout the State. "Smokers, hunters and berry pickers" fires show a decided decrease over former years. The same is true of "Steam sawmills" and "Children" fires. "Miscellaneous" fires show an increase over 1910, but a decrease over 1909.

The table of forest fires for 1911 shows 2,536 fires, an increase of 1,151 fires over 1910, with the enormous damage of \$537,749, burning over nearly 100,000 acres, with a cost to extinguish of \$47,093. The most severe fires occurred in the months of April and May during the severe drought.

COMPARATIVE DAMAGES BY FOREST FIRES FOR THE PAST THREE YEARS.

MONTHS.	1909.		1910.		1911.	
	Acres.	Damage.	Acres.	Damage.	Acres.	Damage.
January,	13	—	—	—	140	\$210
February,	12	—	—	—	7	25
March,	1,577	\$4,763	12,666	\$57,740	1,693	4,233
April,	12,515	72,195	13,782	68,867	29,213	138,120
May,	4,322	38,000	4,236	13,957	61,501	359,356
June,	405	11,870	137	980	622	3,638
July,	11,992	26,396	1,041	6,509	4,241	24,844
August,	1,940	10,833	165	1,275	2,226	7,204
September,	1,092	21,413	2,900	15,035	4	10
October,	384	1,805	7,068	40,064	10	32
November,	585	612	107	400	36	77
No date given,	246	1,515	114	556	—	—
Totals,	35,083	\$189,482	42,221	\$205,383	99,693	\$537,749

COMPARATIVE CAUSES OF FOREST FIRES FOR THE PAST THREE YEARS.

CAUSES.	1909.		1910.		1911.	
	Num- ber.	Per Cent.	Num- ber.	Per Cent.	Num- ber.	Per Cent.
Unknown,	360	25.1	413	32.9	1,128	44.5
Railroad,	497	34.7	362	28.8	685	27.0
Burning brush,	149	10.4	203	16.2	135	5.3
Smokers, hunters, berry pickers, . . .	140	9.7	124	9.9	158	6.2
Steam sawmills,	5	.5	1	.1	3	.1
Children,	92	6.4	75	5.9	118	4.7
Miscellaneous,	190	13.2	78	6.2	309	12.2
Too late for tabulation,	63	—	129	—	—	—
Totals,	1,496	100.0	1,385	100.0	2,536	100.0

FOREST FIRES OF 1911.

MONTHS.	Acres.	Damage.	Cost to put out.	Number.
January,	140	\$210	\$50	29
February,	7	25	14	8
March,	1,693	4,233	859	191
April,	29,213	138,120	11,659	990
May,	61,501	359,356	24,337	837
June,	622	3,638	1,016	60
July,	4,241	24,844	6,388	205
August,	2,226	7,204	2,710	90
September,	4	10	21	4
October,	10	32	17	6
November,	37	77	22	7
December,	—	—	—	—
No date given,	—	—	—	109
Totals,	99,694	\$537,749	\$47,093	2,536

UNITED STATES GOVERNMENT AID.

The Weeks bill, so called, recently passed by Congress, providing for the purchase of portions of the White Mountain and Appalachian Mountain regions to be held as government reservations, also carried an appropriation of \$200,000 for the protection against forest fires of the watersheds of navigable streams in the United States. One thousand eight hundred dollars of this appropriation was allotted to the State of Mas-

sachusetts to be expended in co-operative effort in such sections of the Commonwealth as would properly come within the provisions of the bill. This restricted our co-operative work to the western portion of the State, including the watersheds of the Nashua, Chicopee, Miller, Thames, Blackstone, Hudson, Connecticut and Deerfield rivers. As it was late in the season before final arrangements could be completed with the government, and as an unusually wet season prevailed, we were able to use only \$360 of the allotment, allowing the balance to apply to the operations to be carried on in the year 1912. Under the terms of the agreement entered into with the United States government the State is required to expend an amount equal to that expended by the federal authorities in protecting the above-named territory.

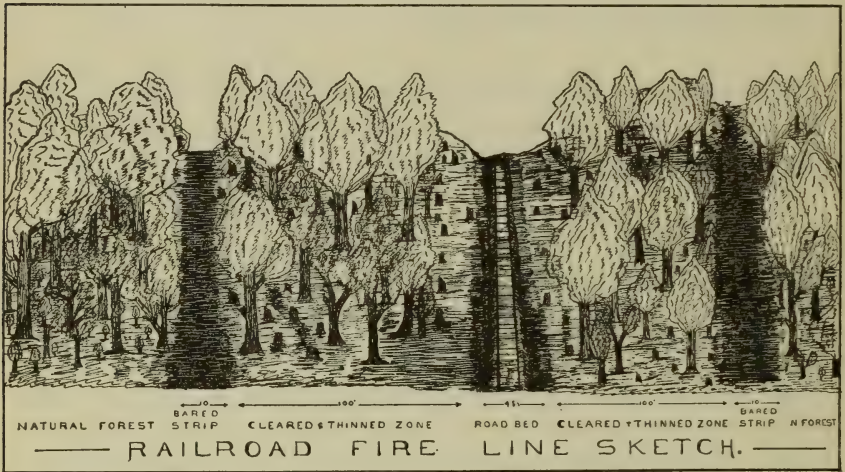
RAILROAD CO-OPERATION IN FOREST FIRE FIGHTING.

In tabulating our forest fire reports for the past season, while we find that the total number of fires from all causes is greatly in excess of former years, owing to the severe drought, the percentage of railroad fires is slightly reduced, although they still outnumber those of any other known cause. I sometimes think we are too hasty to criticize the railroads, not knowing the exact conditions they have to contend with; and unless one has made a study of railroad fires and preventive methods it is difficult to realize what it means to the railroads to completely eliminate railroad fires.

At this point allow me to say that the railroad fire proposition in this State is just in its infancy; therefore there is a chance for a great improvement. When we take into consideration that there are 2,110 miles of track and over 1,000 locomotives in use throughout the State it is not surprising that we must necessarily have a large number of forest fires from this source. Massachusetts is not the only State having this trouble, but practically every State throughout the west, where wood, coal or coke are used for fuel, is having the same experience.

Railroad officials throughout the country have been endeavoring for the past few years to construct a spark arrester, whereby railroad fires would be eliminated and also allow the free steaming of a locomotive. What is the result? Thousands of dollars have been spent on this alone, and still they are unable to meet the requirements. During the past season tests have been made on different railroads of new types of spark arresters or spark and cinder collectors, whereby the cinders are returned to the firebox and reburned, thereby saving a certain percentage in coal and practically eliminating railroad fires from this source. They are at present in the experimental stage, with the outlook very favorable that they will accomplish the desired results, and if this proves true, the railroads of the Commonwealth of Massachusetts will, without doubt, adopt them, thereby saving the many thousands of dollars they are annually paying out for fighting railroad fires and in settling railroad fire damages.

Owing to the above facts, it seems very necessary that the present railroad fire laws be more rigidly enforced. Section 1 of chapter 431, Acts of 1907, says: "Every corporation operating a steam railroad within the commonwealth shall, between the first day of April and the first day of December of each year, keep its right of way clear of dead leaves, dry grass," etc. I have made a personal inspection of several of the different branches of roads throughout the State, and find that this portion of the law has not been complied with. I find in many instances the grass and brush along the right of way has been cut but not burned or removed, which is very essential in order to prevent fires. The outcome is that we



have miles of railroad within the State with the right of way covered with dry grass and leaves, thereby causing immediate danger the first dry days in the spring.

It also seems to me that owners of timber lands adjoining the right of way are not using proper precaution to protect their property. It is a very easy matter, and one which entails very little expense, to clean out from the timber the underbrush and debris on a strip 75 feet in width next to the railroad right of way, thus mitigating the danger of fire very materially. Beyond this cleaned strip a regular fire line 10 feet wide should then be made by cutting the wood or timber, burning the brush, and keeping it as free as possible from grass and leaves. The cut on this page is an illustration of a modern fire line which will save property owners in this State many thousands of dollars if they will adopt it.

It is the contention among railroad officials that many railroad fires originate from cigar or cigarette stubs thrown from smoking-car windows. This is undoubtedly true in a great many instances, and there is no doubt that railroad fire claims have been paid that originated from this cause. The percentage of such fires we do not know. Allowing that 5

per cent. of these fires come from this cause, would it not be a good business proposition for the railroads in this Commonwealth to screen their smoking cars, thereby eliminating every railroad fire from this source? The expense would be nominal compared to the constant drain on them for fire losses. Reports made to this department show 685 railroad fires, burning over 29,842 acres, with a cost for extinguishing of \$10,949.46 and a damage cost of \$330,389.50.

Respectfully submitted,

M. C. HUTCHINS,
State Fire Warden.

BOSTON, MASS., NOV. 30, 1911.

THE CHESTNUT BARK DISEASE (*Diaporthe parasitica*).

In my last annual report mention was made of the presence of the chestnut bark disease in this State, and that the State Forester had taken the matter up with Dr. Haven Metcalf, pathologist in charge of the Bureau of Plant Industry, United States Department of Agriculture, in order to determine, if possible, by co-operative effort, to what extent the disease exists in Massachusetts. Although it was known that the disease had caused irreparable damage to the chestnut growth of several States, notably New York, New Jersey, Pennsylvania and Connecticut, it was thought to have gained only a slight foothold in Massachusetts, but the report of Prof. Arthur H. Graves, the United States government expert, who, under the direction of the State Forester, made an investigation, shows that it is far more widespread and serious than was suspected by the most radical students of the disease.

The report of Mr. Graves is in part as follows: —

The chestnut bark blight has been found in 72 Massachusetts towns. The disease appears to be more general in the south-central and southwestern parts of the State. This is perhaps due to the fact that these portions are nearer to the badly infested regions in New York and Connecticut, and possibly also because on the whole more chestnut occurs here than in other parts of the State. In the southern part of Berkshire County the disease has already done a great deal of damage. There is every reason to believe that if the disease continues to spread as it has within the last half dozen years, it will ultimately cause tremendous havoc in Massachusetts, as it has already done in New York, New Jersey and Connecticut.

Supplementing the report of Professor Graves, Professor Metcalf writes the State Forester that “during the past summer the

disease has spread more than in all its previous history. Whatever is done in Massachusetts, as well as in every other State north of Virginia, must be done within the next year. Otherwise we definitely face the issue of the extinction of the chestnut tree. The methods of control already adopted in New York and Pennsylvania are the only practical methods that we know of controlling the disease. These methods are, briefly, the location and destruction of the small advance infection beginning in that part of the State farthest away from the center of infection. We cannot too strongly advise the eradication as soon as possible of all advance infection of this disease in Massachusetts, beginning in the eastern part of the State. It is probably already too late to save the southwestern part of the State by any method."

The State Forester is anxious to give to the public all the information obtainable relative to this disease, such as the above reports. He believes that valuable tracts of chestnut properly handled along forestry lines may be protected from serious injury, and he will be pleased to advise owners of such properties the best protective measures to employ. A bulletin recently issued by him treating of the disease and its remedy, with illustrations, will be mailed upon request to citizens of Massachusetts. Another bulletin discussing the entire situation, giving the method of control in detail and the status of the disease in the United States as a whole, may be obtained by applying to the United States Department of Agriculture, Washington, D. C.

LIST OF MASSACHUSETTS TOWNS (BY COUNTIES) IN WHICH THE
CHESTNUT BARK DISEASE HAS BEEN FOUND.

Berkshire County.

Alford, 2 or 3 per cent.	New Marlborough, general infection.
Egremont.	North Adams, scattering.
Great Barrington, 50 per cent. in spots.	Richmond, scattering.
Hancock, scattering.	Sheffield, 5 or 10 per cent. in spots.
Lee, 50 or 60 per cent. in spots.	Stockbridge, general infection.
Lenox, 10 per cent.	Tyringham, one tree found.
Monterey, scattering.	West Stockbridge, general.
Mount Washington, 50 per cent. or more.	Williamstown, a few trees.

Franklin County.

Buckland, scattering.	Gill, one tract found diseased.
Charlemont, a few trees.	Shelburne, scattering.
Deerfield, 10 or 20 per cent.	Sunderland, 50 per cent.
Erving, a few trees.	Whately, 30 or 40 per cent.

Hampshire County.

Amherst, general.	Hatfield, general.
Belchertown, scattering.	Huntington, general.
Easthampton, scattering.	Northampton, general.
Granby, scattering.	Pelham, scattering.
Hadley, very bad, 50 per cent. or more.	South Hadley, scattering.

Hampden County.

Brimfield, scattering.	Palmer, scattering.
Chester, general.	Russell, general.
Chicopee, general.	Springfield, general.
Holyoke, general.	Westfield, general.
Longmeadow, general.	West Springfield, general.
Montgomery, general.	Wilbraham, general.

Worcester County.

Athol, general.	Millbury, scattering.
Auburn, scattering.	New Salem, four trees.
Barre, scattering.	Northbridge, scattering.
Dana, scattering.	Petersham, general.
Dudley, scattering.	Shrewsbury, general.
Grafton, scattering.	Southborough, one tree found.
Harvard, scattering.	Sutton, scattering.
Hardwick, 12 trees.	Uxbridge.
Leicester, three trees seen.	

Middlesex County.

Bedford, one tree.	Marlborough, one or two trees found.
Framingham, a few trees found.	Wayland, a few trees found.

Norfolk County.

Canton, two trees found.	Norwood, several trees found.
Dedham, one tree found.	Sharon, several trees found.

Bristol County.

Attleborough, scattering.

PROPOSED CURE FOR THE LUMBERING SLASH EVIL.

The sketch on page 43 represents the State Forester's idea for lessening the danger of forest fires starting in slash. He believes that a property owner has no right to endanger the property of a neighbor by leaving a lot of dried and easily inflammable slash bordering on or even encroaching on the other's woodland. To compel an owner, however, to burn his entire slash after a lumbering operation is an expensive and often needless operation. Sufficient protection can be had by dragging back all the dead limbs and tops for a

space of 40 or 75 feet, and leaving it there until it can be burned safely.

This was done by this department in one instance, a strip 60 feet wide and 100 rods long being cleared at an expense of \$40. This work was done after the slash had been lying on the ground for two years and had become well matted down and consequently hard to handle. Had it been done while the logging was going on the expense would have been comparatively small, because it is necessary to handle the slash over more or less in the work of logging, and the additional work necessary to clear a strip as described is not great. (See illustration on page 43.) Legislation was introduced by the State Forester last year looking to a regulation of this kind, but it was not reported by the committee.

LECTURES AND ADDRESSES.

The demand upon the State Forester for engagements in the State and abroad have been very great, and he has been compelled to send assistants to take his place at times. The usual custom of last year to make the meetings open to the public and ask for a guarantee of an audience of one hundred or more has proved very satisfactory.

The usual lectures were given at the Massachusetts Agricultural College during the winter.

The following organizations, clubs and associations were addressed during the year: —

Massachusetts State Board of Agriculture, Winter Meeting.	International Paper Company, New York.
Boston Y. M. C. A.	New England Water Works Association.
Boston Lumbermen's Association.	Melrose Woman's Club.
American Forestry Association.	Taunton Men's Club.
Cape Ann Scientific and Literary Society.	Milford Woman's Club.
Boston City Club.	Revere Woman's Club.
Chamber of Commerce, Boston.	Sharon Fortnightly Club.
Springfield High School of Commerce.	Massachusetts Forestry Association.
Massachusetts Agricultural College.	Athol Men's Club.
Boston High School of Commerce.	Ohio State University Club.
Massachusetts Retail Lumbermen's Association.	Massachusetts Agricultural Club.
Middleborough Cabot Club.	Norwood Business Men's Association.
Newton Highlands, Episcopal Men's Club.	Society for the Promotion of Agricultural Science.
Union Club, Governor Rollins.	Waltham Baptists Men's Club.
Tyngsborough Village Improvement Association.	North Andover Village Improvement Association.
	Boston Wholesale Lumbermen.

Fitchburg Board of Trade.
Brewster Grange.
The Rural Club.
Weston Boys' School.
Pepperell State Grange Field Day.
Eastern Forester's Association.
Dudley State Grange Field Day.
Dracut State Grange Field Day.
Randolph Woman's Club.
Third National Conservation Congress.
Townsend Board of Trade.
Nantucket Teacher's Association.
Swampscott Woman's Club.
Shirley Improvement Association.
Greenfield Woman's Club.
Association of American Colleges and
Experiment Stations.
Mansfield Men's Club.
Old Boston Dining Club.

Massachusetts Forestry Association.
Lumber Salesmen's Club.
Grange, Turner Center, Maine.
Foxborough Board of Trade.
Springfield Board of Trade.
Lenox Horticultural Society.
Massachusetts State Board of Agri-
culture, Annual Meeting.
Weymouth Grange.
Worcester Central Pomona Grange.
Massachusetts Firemen's Association.
Lexington Men's Club.
Plymouth Natural History Society.
Scituate Men's Club.
Wilmington Men's Club.
Woburn Grange.
Worthington Grange.
Massachusetts State Y. M. C. A.
Cohasset Men's Club.

The Third National Conservation Congress met at Kansas City, Mo., September 25 to 27, and the State Forester was appointed a delegate by Governor Foss.

The congress proved a very interesting and instructive one. The following paper was presented by the State Forester: —

CONSERVATION, RESTORATION AND ECONOMIC UTILIZATION OF MASSACHUSETTS NATURAL RESOURCES.

In complying with the request of the officials of this association in reporting herewith for the State of Massachusetts, I wish to say at the outset that I certainly feel incompetent to undertake the task of pointing out the numerous activities that the good old Bay State is fostering. Being a Massachusetts citizen by adoption, I feel privileged to express myself the more frankly, as otherwise my report might seem prejudiced.

We have in Massachusetts in the first place a conservation of the old-time ancestry which is not only renowned for its brilliant deeds in the nation's early history, but is still firm and abiding even after these many years. What state has a fairer reputation in its dissemination of its natural resources, and still lives to enter more heartily into the conservation and restoration of those remaining?

The historic setting and general environment of Massachusetts in the early days of the nation are natural resources that constitute an ever-bubbling fountain. Yearly the pilgrimage to the old Bay State of thousands upon thousands from throughout the nation, to visit Boston, Concord, Lexington, Arlington, Cambridge, Salem, Plymouth and a score of other cities and towns, goes to show what the conservation of high ideals and true patriotism means.

The State has always been liberal, progressive and a natural leader in all that stands for education, advancement and enlightenment. Many wonder at the splendid showing that Massachusetts always makes, and seem confounded at her successful progress. The explanation is that as a State we do not confine our interests to State bounds, but our people are equally interested in promoting and developing copper and other mines, or sheep ranches and other industries, in the south or west, as much as they are at home. Succeeding elsewhere means also better opportunities for home development. In this way mutual associations and enterprises of a stalwart and permanent nature are established.

The old biblical saying that it is more blessed to give than to receive is literally true of the old Bay State. While she has been generous in the nation's life, yet there are few States that for their size have greater natural advantages and hold out better prospects for success in the future.

Contrary to the minds of many, Massachusetts has advantages that are hard to surpass. I wonder how many have read the article entitled "Golden New England," by Sylvester Baxter, which appeared in the "Outlook" in 1910. If not, you may be interested in doing so. The author therein portrays various rural industries and very entertainingly points out their success. One of our enterprising business houses, N. W. Harris & Co., bankers, Boston, very kindly has sent out excerpts to those desiring the same.

Massachusetts is a State with many manufacturing centers, and therefore a great consumer of all kinds of resources, particularly in the raw material. This material is put through our factories and goes out as the manufactured article.

Our high standard of education in literature, science and art has evolved men of usefulness. In the modern or applied sciences we point with pride to our technical, agricultural and trade schools, which are already accomplishing results toward conservation, restoration and economic utilization of natural resources.

Massachusetts people began to see the handwriting on the wall many years ago, and even before this congress was born they were agitating and accomplishing actual results. Our cities and towns are already well forearmed with generous water supplies. The great metropolitan water system of Boston and its suburbs, already a reality, is one of the greatest engineering feats yet accomplished in its line. Our metropolitan and municipal park systems are a credit to our people. The State highway system of Massachusetts needs no introduction to an intelligent audience like this, as its reputation has attracted road engineers from all over the world, and many States have come to the Massachusetts Highway Commission and induced our men to go away. Dr. Field of the Fish and Game Commission is here at the convention; hence he will inform you of this field of our activity. Simply let me say that our marine natural resources are far greater than most people realize. Massachusetts has a large and important coastal boundary, and were I able to tell you of the great

possible future we have in mind, even for the old historic Cape Cod country, I know it would interest you. While the great fishing industries of old Gloucester, Nantucket and New Bedford are not as thriving as in earlier times, nevertheless, with the guidance of modern science to water farming, we have great promise of the restoration of these industries that will go far toward feeding the nation in the future.

Speaking of fishing and game, forestry, natural history and Appalachian clubs, I am frank to say that I believe there are no people on earth who are more in love with nature herself, heart and soul, than our Massachusetts people. We have organizations galore, and they are not only organized, but bubbling full of real activity, and are accomplishing things. Were you the State Forester of Massachusetts, I can guarantee that you could spend your whole time simply lecturing on conservation or forestry, as the demands are so great and the work so popular.

Insect Depredations.

In the development of a new nation it invariably follows that conditions are constantly changing, and as intercourse with other nations progresses, through trade and business relations, the evils and blessings are shared. While we are greatly indebted to the various countries of the world for many an introduction, nevertheless now and then we unfortunately get an insect, or fungous development, which proves extremely disastrous.

It would not be fair to Massachusetts in reporting on her conservation policies did I not mention the great fight that the State has waged for years against the gypsy and brown-tail moths. These two insects are indigenous to Europe, and while they have their natural enemies and are under subjection there, upon reaching this country they find an open field, and, with no enemies, become a veritable pest.

Both species are destroyers of trees. The brown-tail moth devours the leaves of the deciduous or hardwood trees only, while the gypsy moth is no respecter of vegetation, and will defoliate evergreens as well, if food is scarce, although it, too, prefers the deciduous trees. The brown-tail moths, besides being tree destroyers, give off hairs from the larva and moth which, when brought in contact with the skin of human beings, produce a rash that is extremely irritating. Of the two insects the gypsy moth is generally considered the worse. The facts that when the white pine or other evergreens are once stripped they die outright, and that the pine in particular is one of our most valuable species, both from the economic and æsthetic standpoint, make their protection from the gypsy moth important.

I will not take time to give you the life histories of these insects, for should any one be interested this information can be had by applying to the State Forester, Boston, Mass. We have illustrated matter in natural colors, showing these insects.

Practically all of our trees in the residential sections of cities and towns in the eastern part of the State are sprayed annually. Our main traveled

roadsides are sprayed each year. Individuals, the municipalities, towns and the State all co-operate in this work. The annual appropriation of the State is \$315,000 a year. The total expenditure from all sources in this work within the State up to the present time is estimated at \$6,000,000. Besides this, the United States government has spent in Massachusetts probably \$700,000. We have had as many as 2,700 men at work at one time in the busiest season of the year. The renowned North Shore, our fashionable summer resort, spends practically \$100,000 a year to protect the trees in that section alone.

The State Forester's spraying apparatus is composed of an aggregation of 300 spraying outfits. We use in a single season over 400 tons of arsenate of lead, the State's contract alone being for 250 tons a year.

During the past two years the State Forester's department has made great improvements in power-spraying equipment, the cost of spraying woodland having been reduced from \$30 or more per acre to as low as \$6 in some instances. Instead of its being necessary to climb trees, as heretofore, the modern power sprayer enables us to spray from the ground directly over the tops of tall trees. The whole spraying problem has been revolutionized. It is certainly to be hoped that these insects may not secure a foothold elsewhere. Surely Massachusetts is doing her part, and I cannot urge too strongly the necessity of other States and the nation realizing the importance of this work. We have introduced parasites from all over the world, and they are showing great promise. The work with disease also seems very effective, and the writer feels optimistic. It is very clear that the practice of modern forestry methods and the employment of highly developed mechanical devices are doing much, and we trust ere long the parasites and diseases will bring about the desired result.

Forestry.

Massachusetts is enthusiastically interested in forestry, and the State Forester this past season was given an appropriation of \$10,000 for forest fire work. We have appointed a State Forest Fire Warden, who is organizing and perfecting a workable system. He is also establishing lookout stations and patrol systems in different sections of the State.

Our forest management, reforestation and general forestry, educational and demonstration work are all well established and progressing. We have 3,000,000 trees in the State nursery for use another season. The State is planting 1,000 acres each year, and our lumbermen and people generally are showing interest, and doing more each season. Our appropriation, including that for forest fires this past year, was \$30,000.

Restoration v. Conservation of Natural Resources.

In Massachusetts the work of restoration is even of more importance than conservation when applied to forestry. The annual cut of our forest products at present amounts to only 5 per cent. of that used each year throughout the Commonwealth for manufacturing, building and

other purposes. Surely we can and ought to supply a larger amount of our own home-grown woods. Although the State has been well cut over, even now our present wood harvests play an important factor in the industries of many of our rural sections. While we believe thoroughly in conservation where it will apply, still the more potent force begins further back. We need to teach the A B C of restoration in forestry. When our work of reforestation shall have begun to demonstrate its value, it will be an object lesson which will mean much toward perfecting a better State forest policy.

Practical forest restoration, therefore, is what Massachusetts needs most. If we will reconvert our hilly, rocky, mountainous, moist, sandy and waste nonagricultural lands generally into productive forests, the future financial success from rural sections of the Commonwealth is assured. This is no idle dream; it can be accomplished. Massachusetts is a natural forest country and all that is needed is simply to assist nature, stop forest fires and formulate constructive policies. Then we can grow as fine forests as can be found anywhere. Germany and many of the countries of the old world have already demonstrated what can be done. Are we to be less thrifty and farsighted? Americans do things when they are once aroused, and it is believed that reforestation and the adopting of modern forestry management must be given due consideration in this State from now on.

The writer has been delighted in following the interest that has been aroused and the great tendency for all our people to not only welcome and appreciate the new idea of "conservation," but to even credit the term or phrase as covering every phase of new endeavor.

It is not my purpose to lessen the glory one whit or bedim a single gem in the crown of the national phrase "Conservation of natural resources," nor could I were it to be tried, for the heralded motto has already stamped itself firmly upon the nation.

As time goes on, however, it will be found that our popular phrase will not carry with it the whole panacea of overcoming our wasteful and depleting conditions, and that new and equally applicable terms, though perhaps never so popular, will come to express more aptly our real needs.

To my mind the phrase "Restoration of natural resources" vies with that of "Conservation of natural resources," and expresses a force to be aroused in the nation for good that in many ways surpasses the present popular one.

We have our forest reserves and minerals that are left, and now to conserve them economically is a worthy undertaking; but in the older sections of the nation to conserve what we have in depleted and worn-out lands and forests is to pick the bones of the withered and shrunken carcass.

Let conservation apply where it may, but the force that is needed in Massachusetts and all of New England, yea, the south, extending even

well into the middle of the nation, following the great depleting agricultural cereal and cotton crops on the one hand, and the lumberman's axe and forest fires on the other, is greater than this term can begin to express.

The term "Restoration of natural resources," I claim meets our present needs far better, and breathes greater hope and definite accomplishments for our children's children in the future.

The following paper by F. W. Rane, State Forester of Massachusetts, was read before the New England Water Works Association, March 8, 1911:—

THE REFORESTATION OF WATERSHEDS FOR DOMESTIC SUPPLIES.

Mr. President and Gentlemen of the New England Water Works Association:—The subject of municipal forests is more or less of a new idea, but I can see where forestry and water works are naturally coming together more and more. Most of you gentlemen, I take it, are engineers. Now, how can forestry come in along with your lines of work? I think the subject is likely to be of more and more importance, as time goes on, to water-works people. I take it for granted that a great many of the works represented here are municipal works. Some of them may be private corporations, but they are all run upon practically the same lines. A few years ago, in 1908 I think it was, we had occasion in the State Forestry office to work out a plan for the city of Fall River, covering about 3,000 acres. At that time the mayor and the commissioners and the engineer had an idea that they were going to carry the plan into effect, but for some reason or other it unfortunately has not been carried out to the extent that they had hoped it would be. They are doing something, however. They have an area of about 3,000 acres surrounding their water supply, and if any of you are interested in the report we made, I have extra copies at the office and would be glad to send them to you upon application.

At that time I read a paper before one of our scientific societies, the subject of which was "Municipal, Corporation and Private Ownership Forests," and, with your permission, I will read you a few paragraphs from that paper bearing particularly upon the subject of municipal forests:—

The time is ripe for the development of this type of forestry. I believe all that is required at present is to agitate the subject and to explain how easily and economically it can be brought about. Our cities and towns have sprung up by the hundreds and thousands throughout the land. Their development has been proportionate to their natural advantages. Permanency has become more stable as time has gone on, until to-day finds us with municipalities ready and willing to accept and adopt almost any measure that will develop a better future and a busier center of population. Our cities and towns have been solving the problems of a permanent and efficient water supply, sewerage system, etc. Our boards of health tell us that a pure water supply is absolutely necessary to longevity of our population. Municipal forests about the drainage basins of our water sup-

plies and reservoirs can be made not only an important factor in conserving the water supply and in improving sanitary conditions, but, if put under a modern system of forestry management, could be made a great economic factor in the production of wood and lumber. They may also comprise one of the great æsthetic features of the section. The time element as a factor, so objectionable to the private owner in investing in forestry undertakings, need not be considered here. The advent of the automobile and rapid transit has so enlarged the conceptions of the average citizen that instead of being content with shade trees and park systems he longs for the depth and quiet of large tracts of woods, which may be furnished almost without cost through the wise forethought of our municipalities. Who has visited Germany without being impressed with the trip into the Black Forest? These very forests are not only beautiful and renowned, but through their scientific treatment yield splendid net financial returns. Within walking distance from many of the cities, one can step into finer woods than can be found in our best eastern States. Spruce and fir trees 2 to 3 feet through and all the way up to 125 feet high stand on the ground as thickly as they can stand. There are acres that would cut more than 100,000 feet board measure.

Municipal forests, therefore, will do much as object lessons, and their permanency and importance will assist very materially in forming a workable local, State and national policy.

The State Forester of Massachusetts has completed a working plan for the city of Fall River this season for a municipal forest of 3,000 acres. We are working on similar projects for three more cities at present, with still others on the waiting list. The Metropolitan Water and Sewerage Board of Boston have completed planting 1,100 acres to forest trees about their new reservoir this fall. The city of Helena, Mont., has planted a forest of 900 acres. Warren Manning, the noted landscape gardener, the designer of the Jamestown Exposition grounds, etc., is an enthusiastic advocate of the broader forestry municipal development, as going hand in hand with landscape gardening.

In a State like Massachusetts, where many park reservations like Mount Tom, Wachusett, Greylock, Blue Hills, metropolitan park system, Mount Everett, etc., have already been set aside for public purposes, if to these park systems, municipal parks and forests be added as well as corporation and private forests, together with increased holdings for fish and game preserves, it is evident that conditions will be developed which will make our State greatly to be envied. What has been and may be accomplished in Massachusetts can be wrought with equal ease throughout the Union to a greater or less degree.

Considering an imperative necessity for the growing of our future forest products, and considering the opportunity for business corporations and men to not only secure financial gain but bring great good to their respective communities, there certainly will be need in the future for all our well-directed acts of the present day. Is it not exceedingly fortunate that the conditions outlined do exist, and that the solving of them offers hopes to the future? It is fortunate, too, that as a people we are ever ready and quick to respond to any undertaking, no matter how strenuous the task, provided it will secure us benefit and reward. I have every hope, therefore, that our forestry problem will receive an early consideration at the hands of our people, and that all sections of the Union will do their respective parts in conserving the forests we already have and adopting modern methods of forest management, as well as in reforesting lands unadapted to agriculture, returning them to forests, for which to all intent and purposes they were created.

There has been of late much discussion on the subject of forests and their relation to stream flow, and we could, if we chose, give you a sermon on this subject, but we have elected in this article to present to you the financial side of the question; in other words, the money profit which

towns may obtain from lands which are now in their possession lying idle and unused. We believe that the time is not far distant when municipalities, like the State and nation, will take up forestry development in their midst, and that our towns and cities, like the communities of the Old World, will own their municipal forests. On the land which they have already acquired for the protection of a water supply is the place to begin.

Appended is given a list of 47 towns holding such lands, and the area held. Ten of these have sought advice from this office in regard to the management of their lands, and 8 have in part carried out our suggestions, yet we are compelled to say that even these are only playing at forestry work.

No one is in a more fortunate position to practice forestry than a municipal water commission. It has as a rule no taxes to pay, the time element so detrimental to private ownership is wanting, because a municipality has, in theory at least, an everlasting existence, and the land which was bought as a protection for the water supply, from the forestry standpoint costs them nothing.

The Metropolitan Water Board has planted some 1,200 acres of land with pine and hardwoods at an average cost of \$20 per acre. In addition, in the first ten years they have had to spend \$6 per acre for improvement cutting, and about 25 cents per year for fire patrol. The studies of this office have shown that average land planted to pine will yield 46,500 feet per acre in fifty years, worth on the stump at present prices \$465. Now let us balance these figures, figuring our investment at 3½ per cent., a fair average rate of interest on most municipal bonds.

		Stumpage Yield per Acre.
Cost of planting at \$20 for fifty years, interest 3½ per cent. compounded,	\$111 70	\$465 00
Improvement cuttings at \$6 for forty years, interest compounded at 3½ per cent.,	23 75	
Fire patrol 25 cents per year for fifty years, interest compounded at 3½ per cent.,	33 90	
Add to make even dollars,	65	
	<hr/>	<hr/>
	\$170 00	\$465 00

This leaves a net balance of \$290 profit per acre over and above 3½ per cent. return on the money invested, a rate of return equal to 7½ per cent., and this is based on stumpage prices prevailing at the present time, and stumpage will certainly be worth no less fifty years hence. Will you not agree with us that a town that holds land which is lying waste and idle, owned merely to keep some one from living on it, is committing a grave economic mistake when it fails to develop it into a forest?

To take a practical example of the value that forestry can be to a town, Westfield owns 942 acres of land on its watershed in Granville, of which this office made a careful study. We found that 488 acres of this area were covered with some form of woodland and 454 acres were more or less

cleared, 315 of which could be planted. We made our estimate of the income which may be derived from this land, giving its value at the time of cutting, basing the amount on present stumpage values.

TYPES OF LAND.	Area (Acres).	Stumpage Value.	Ready to cut.
Large hardwoods,	33	\$2,640 00	Present.
Large pine,	4	800 00	Present.
Medium hardwoods,	36	3,000 00	10 years.
Medium pine,	4½	900 00	12 years.
Medium pine and hardwoods,	21	1,500 00	10 years.
Culled land,	160	15,000 00	25 years.
Small hardwoods,	104	8,000 00	18 years.
Pine planted,	315	108,000 00	50 years.

These figures when added show a net income to the town during the coming fifty years of approximately \$140,000. To arrive at the net income on the planted land we have deducted \$6,300 as cost of planting, \$1,890 for improvement cuttings, \$3,780 for fire patrol and \$26,500 for taxes on the planted land. Taxes on the woodland (it being located in another town) would have to be paid whether forestry work was carried on or not, so they were not deducted in estimating the returns on the forested land.

We cannot, in the narrow limits of this article, give the processes by which we arrived at the above conclusions, but we ask you to take them on faith, assuring you that we have done our best to be conservative in our estimates, basing them, as we said before, on the present values of lumber land.

This office has given suggestions to 10 municipalities that have asked for our advice, and these suggestions have been embodied in written reports, in some cases in great detail. We stand ready to help any community in the State, the extent to which we will offer our services depending a great deal on how far the town will go in carrying out our suggestions after they have been made. The only cost to the town is for the traveling expenses of the man or men who make the examination and report. Most of the other States in New England have forestry officers who will give the same service, and where they cannot be secured there are firms of consulting foresters who can be called upon to give advice without excessive cost.

MUNICIPAL WATER SUPPLY LANDS.

List of Cities and Towns which have sought Advice from the State Forester concerning Forest Management of Such Lands, and Record of Accomplishments to Date. All since Fall River Report of 1909.

CITY OR TOWN.	Ownership, Municipal or Private Company.	Watershed Owned (Acres).	Existing Woodland (Acres).	Planting accomplished (Acres).	Plantable Area remaining (Acres).
1. Fall River, . . .	City, . . .	2,940.6	2,507	5	433
2. Westfield, . . .	Town, . . .	942.0	488	20	454
3. Holyoke, . . .	City, . . .	2,200.0	1,400	12	800
4. Leominster, . . .	Town, . . .	94.7	(?)	12	None.
5. Fitchburg, . . .	City, . . .	400.0	250	None.	150
6. Amherst, . . .	Company, . . .	131.0	(?)	35	(?)
7. Needham, . . .	Town, . . .	91.6	50	5	35
8. Hudson, . . .	Town, . . .	162.0	(?)	18	(?)
9. Milford, . . .	Company, . . .	36.0	16	None.	20
10. Pittsfield, . . .	City, . . .	1,123.0	723	None.	400

TENTATIVE LIST OF 37 CITIES AND TOWNS HAVING WATER SUPPLY LANDS POSSIBLY CAPABLE OF FORESTING. TWENTY-FIVE ACRES AND OVER.

[Project as yet unconsidered. Areas from State Board of Health.]

CITY OR TOWN.	How owned.	Watershed (Acres).
1. Adams,	Fire district,	33.5
2. Athol,	Town,	301.0
3. Attleborough,	Town,	300.0
4. Barre,	Company,	35.0
5. Billerica,	Town,	25.8
6. Brockton,	City,	225.0
7. Clinton,	Town,	197.5
8. Falmouth,	Town,	82.2
9. Foxborough,	District,	26.0
10. Hatfield,	Town,	40.0
11. Haverhill,	City,	668.0
12. Lenox,	Company,	167.0
13. Lowell,	City,	157.4
14. Merrimac,	Town,	31.0
15. Nantucket,	Company,	32.0
16. New Bedford,	City,	1,682.0
17. Newburyport,	City,	105.0
18. Newton,	City,	721.0
19. Northampton,	City,	786.3
20. Northbridge,	Company,	334.0
21. North Adams,	City,	3,942.9
22. North Brookfield,	Town,	144.8
23. Palmer,	Company,	40.0
24. Peabody,	Town,	98.6
25. Scituate,	Company,	42.0
26. Sharon,	Town,	216.5
27. Southbridge,	Company,	307.4
28. Stoughton,	Town,	56.0
29. Taunton,	City,	110.8
30. Uxbridge,	Town,	64.0
31. Waltham,	City,	40.0
32. Ware,	Town,	41.0
33. Westborough,	Town,	90.0
34. Williamstown,	Company,	96.0
35. Winchendon,	Town,	70.0
36. Worcester,	City,	442.0
37. Wrentham,	Town,	42.5

Add to the above the 10 cities and towns which have already had advice from the State Forester.



A view from the lookout station for forest fires on Grace Mountain, in Warwick. Wachusett Mountain in the background, about thirty miles away.



A portion of the State Forester's nursery at Amherst. These are three-year-old white pine seedlings that will be set out permanently next spring.

The Association of American Colleges and Experiment Stations met at Columbus, O., November 15 to 17, and the Massachusetts State Forester was asked to deliver the following paper before said association: —

FORESTRY: THE PART THAT COLLEGES AND EXPERIMENT STATIONS MAY
PLAY IN ITS DEVELOPMENT.

I feel complimented in being asked by the officials of this association to discuss this subject at this time.

I take it for granted at the outset that forestry is already acknowledged to be a subject worthy of consideration by our colleges and universities and well adapted to a place in their curriculum; also that experiment station officials feel that were they able to enlarge their staff by the addition of a forester, results could be expected in this line of agricultural development in their respective States.

Forestry is nothing other than an agricultural crop which demands modern methods of culture and management, as other plants, for both economic and æsthetic results. The forest crop, or forestry, at once calls to mind a large class or group of plants of the vegetable kingdom whose fundamental importance to a State or nation is necessarily closely related to its success and progress. Wood or lumber finds innumerable uses.

When our forefathers came to these shores they found magnificent primeval forests in all their glory, — a vast field of grain waving before the wind as it were. Individual specimens of white pine in New England, Michigan, Wisconsin and Minnesota; black walnut in Ohio, Pennsylvania, West Virginia and Kentucky; black cherry throughout the eastern United States; chestnut from Massachusetts to Georgia; tulip tree throughout the Appalachian range, — all these and many more species could be found that would cut from 3,000 to 6,000 feet board measure from a single tree. What has become of these monarchs of the forest? To-day we point with pride to the forests of the great west and northwest which still remain, but how long will these forests continue to stand, judging from the wasteful methods of the past? Because the east wasted its birthright, now the west claims similar privileges.

We have possessed a nation flowing with milk and honey, figuratively speaking, streams teeming with fish, precious minerals, coal, oil and natural gas in abundance, wild animals and game of a large variety, forests nearly everywhere, excepting on the rich prairies, soils adaptable to most any kind of a crop, etc., and what have we accomplished with this heritage thus far? We have built and established a nation great among the nations of the world. This we Americans are proud of, and we have every reason to be, as our record shows. It was but yesterday our ancestors arrived here, and to-day we are a world power, — in point of time but a brief minute compared with the lives of nations.

In the development of the nation we have not wanted for natural re-

sources; they have been awaiting our use. To an intelligent audience of scientifically trained men like this it is unnecessary to paint any word picture of our development; to simply ask you to give the subject consideration is to call its evolutionary history to mind.

Presidents, directors and workers generally who have co-operative interests in this organization all realize from their life's work the importance of economic utilization and conservation. There is undoubtedly no force that has met our nation's needs and furthered her real fundamental development of permanency more than the work of the institutions represented in this organization.

At the recent National Conservation Congress, held at Kansas City, I was particularly impressed with the fact that the men whom that organization now falls back upon for permanency are largely the product which is the outgrowth of the work of the land grant colleges and experiment stations. Conservation of natural resources is a phrase which has sprung up like a mushroom in the night, and has emphasized, through its popularity and significance, what appeared at the time a new idea. This sudden culmination, however, was made possible through the educational conditions that have been constantly at work during recent years, together with the psychological time in the nation's development.

In presenting the report from Massachusetts at the recent Conservation Congress, I took the liberty of discussing briefly the subject of "Restoration *v.* Conservation of Natural Resources," and as it is more or less applicable, I beg your indulgence in repeating a part of it: —

In Massachusetts the work of restoration is even of more importance than conservation when applied to forestry. The annual cut of our forest products at present amounts to only 5 per cent. of that used each year throughout the Commonwealth for manufacturing, building and other purposes. Surely we can and ought to supply a larger amount of our own home-grown woods. Although the State has been well cut over, even now our present wood harvests play an important factor in the industries of many of our rural sections. While we believe thoroughly in conservation where it will apply, still the more potent force here begins farther back. We need to teach the A B C of restoration in forestry. When our work of reforestation shall have begun to demonstrate its value, it will be an object lesson which will mean much toward perfecting a better State forest policy.

Practical forest restoration, therefore, is what Massachusetts needs most. If we will reconvert our hilly, rocky, mountainous, moist, sandy and waste non-agricultural lands generally into productive forests, the future financial success from rural sections of the Commonwealth is assured. This is no idle dream; it can be accomplished. Massachusetts is a natural forest country, and all that is needed is simply to assist nature, stop forest fires and formulate constructive policies. Then we can grow as fine forests as can be found anywhere. Germany and many of the countries of the Old World have already demonstrated what can be done. Are we to be less thrifty and farsighted? Americans do things when they are once aroused, and it is believed that reforestation and the adopting of modern forestry management must be given its due consideration in this State from now on.

The writer has been delighted in following the interest that has been aroused and the great tendency for all our people to not only welcome and appreciate the

new idea of "conservation," but to even credit the term or phrase as covering every phase of new endeavor.

It is not my purpose to lessen the glory one whit, or bedim a single gem in the crown of the national phrase "Conservation of natural resources," nor could I were it to be tried, for the heralded motto has already stamped itself firmly upon the nation.

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We have our forest reserves and minerals that are left, and now to conserve them economically is a worthy undertaking, but in the older sections of the nation to conserve what we have in depleted and worn-out lands and forests is to pick the bones of the withered and shrunken carcass.

Let conservation apply where it may, but the force that is needed in Massachusetts and all of New England, yea, the south, extending even well into the middle of the nation, following the great depleting agricultural cereal and cotton crops on the one hand, and the lumberman's axe and forest fires on the other, is greater than this term can begin to express.

The term "Restoration of natural resources" I claim meets our present needs far better and breathes greater hope and definite accomplishments for our children's children in the future.

Forestry, although it is an agricultural crop and must have greater consideration in the future, has not received the attention it deserves until practically the present time. Forest products have been relatively abundant and cheap in nearly all sections of the nation. Suddenly our needs began to outstrip the supply, and then with advancing prices lumbermen and the public generally have gradually awakened to the necessity of providing for our present and future needs. We find that it is not only a question of harvesting the crop from now on, but one of growing it. There has been little demand for educated foresters in the past as the undertakings were mainly those of economic methods of lumbering.

Saw logs in the early days were 16 inches or more in diameter, while to-day with us in New England lumbermen consider the 5-inch saw log of equivalent value. Box boards, usually cut from white pine, regardless of size of the log or gnarliness of the tree, with wany edges and the bark still adhering, bring more money to-day than did square-edge, clean, clear stock not many years ago. A prominent Boston timber cruiser who has spent the past few years throughout the south called at my office within ten days, and his version of the depletion of the natural forest products of that section was really amazing.

To my mind there are few subjects wherein the organizations represented at this association need to participate more actively than that of forestry. Just because there has not been a definite demand and apparent need until now is not an excuse for present lethargy.

The older members of this association can well remember the earnest and farsighted appeal made to this body by the late Samuel B. Green of

the University of Minnesota, Department of Forestry. Professor Green was particularly anxious that the government be called upon to enact a law whereby each State should have a definite appropriation yearly for carrying on forestry work. The idea was carried as far as presenting the matter before Congress, H. R. 9219, known as the Davis forestry bill. The bill called for an appropriation of \$5,000 by the national government, on condition that each State appropriate a like sum. Professor Green said, "When we think of the enormous value of the forest output of this country, the amount requested to educate young men to be competent to take care of this forest wealth seems trivial indeed. I do not wish to see all the agricultural colleges attempting to turn out professional foresters, and such would not be the effect of these proposed expenditures; but the result would be that in a short time we would have a surplus of young men well trained in the basic principles of forestry, through whose efforts the forest sentiment of to-day would crystallize into a permanent and helpful thing."

Do we realize that this plan carried out would mean an expenditure of only \$250,000 a year from the national government, and as well furnish an incentive for the States to take advantage of the assistance? This would result in placing the work on a progressive foundation at once.

For some reason we did not take to the idea enthusiastically. There is no legitimate reason even now for not using our present governmental funds for this work, but this might cause necessary adjustment and financial complication. Consequently we have been prone to let well enough alone.

One thing is certain, we are losing valuable time in not having a more definite and well-defined policy of development for forestry throughout the nation. While here and there our most progressive States are doing something in forestry work which example is worthy, and is gradually being followed by others, nevertheless, we are one people, and a fundamental industry so important to the nation's welfare should enlist all educational leaders of rural economics in its behalf.

Economically the forest crop of the future must play a very important part. Those of you who have not had time to study it may be interested in knowing its importance to even a small State like Massachusetts. We have in Massachusetts approximately 5,400,000 acres of land, and of this acreage three-fifths, or practically 3,000,000 acres are unadapted to tillage or general agriculture. These lands, however, under management can all be devoted to forestry. Upon a single acre of such land we have demonstrated, from a thorough study of the white pine, that we can grow 40,000 feet board measure in fifty years, or an average of 800 feet per year. As stumpage is worth from \$6 to \$12 a thousand at the present time, this would mean an average annual income of from \$4.80 to \$9.60. Were it possible to practice modern forestry management, therefore, over our entire 3,000,000 acres of forest lands in Massachusetts, it would mean an annual income of from \$14,400,000 to \$28,800,000. These figures may

seem very startling at first, but I offer them for your deliberate consideration. Please remember that the above figures are based on present prices in Massachusetts, and I am willing to leave it to your judgment whether future prices are not likely to be even higher.

What is true of the growth of white pine in the old Bay State is more or less true of forestry conditions elsewhere. When we consider stumpage prices, we must consider, also, that these conditions realized mean economic employment of manual labor, teams and machinery, together with the savings of transportation on raw material and the giving of employment to rural sections during the winter, resulting in an all-year-round occupation.

While Massachusetts does not typify every State it exemplifies that forestry and forest products demand our consideration.

The United States Forest Service has done and is doing splendid work which is having desired results, and many States have well-organized departments of State forestry, but it remains for this association, through its present splendid organization, to become more elastic, welcoming the necessary extension of its curriculum and investigations to include forestry.

I believe that every State should have its State Forester, whose whole time can be spent in determining and carrying out a definite State forest policy. Fire protection and regulation, reforestation and general modern forestry management need constant State supervision and encouragement.

With a national and State organization perfected, the only thing lacking is the great assistance that must come from educating the rank and file of our people, who are to own and manage these forest lands. There are no institutions to which this work more naturally falls than to our land grant colleges and experiment stations. Already these institutions are doing for our people everything possible in every other line of agriculture; then why should not forestry be included with horticulture and agronomy? The department of botany necessarily teaches the fundamentals of the science, and with little additional equipment and assistance any botanical department could give a course in forest botany. What is true of botany is equally true of entomology, physics, plant pathology, etc. Again, I firmly believe that forestry should be required in the agriculture courses to a point sufficient for a comprehensive knowledge of it, allowing students opportunities to specialize later on.

The principles of forestry can readily be taught in our short courses and elementary schools provided the fundamentals of botany, soils and nursery work precede the same. But here, again, this is made possible only through competent teachers, the product from the land grant college or similar institution.

Please do not understand me as an advocate of more forestry schools which endeavor to educate the so-called technical forester, as I believe we have probably enough of this class of institutions already, but that there is a great and growing need for a general forestry education sufficient to practicing modern methods, I am certain.

In Massachusetts, again, I believe we have the ideal arrangement. The State Forester has immediate charge of the shaping and carrying out of the State forest policy. The State Forester also gives lectures yearly at the agricultural college, covering his field of work. The Massachusetts Agricultural College has a professor of forestry whose privilege it is to see that all students are taught a working knowledge of the subject. Where certain students have shown special proficiency in forestry they undoubtedly, upon graduation, may secure credits in forestry schools, but the college does not claim to turn out a technically trained forester.

By this system of organization I am convinced that very satisfactory results can be realized. There is certainly plenty of work for a State Forester to accomplish without his being tied down to teaching or doing much research work. His work compels him to be familiar with the general State conditions, and the administration of field work in forestry management, reforestation, nursery work, forest insect and disease depredations, the care and management of State forest reserves, forest fire protection, etc. The handling of the forest fire problem alone requires a great amount of supervision to get satisfactory results. The installation and management of lookout stations, the work of securing modern forest fire-fighting equipment for towns and townships, and keeping it properly housed and cared for so as to be effective for proper and efficient patrol systems in dry times; all these demand constant attention. To keep a forest fire system effective the State Forester must be in close touch with the working unit. What is true of forest fires is equally true of seeing that forest working plans are properly executed, and that all forestry practices are performed in a practical way.

It therefore remains for the professor of forestry to do the teaching of students, and the station forester or the station botanist, entomologist or pathologist to undertake the lines of pure investigation. With this definitely outlined plan results are bound to come.

In closing, I simply desire to appeal to this association in behalf of a more wholesome position than we have yet reached in recognizing forestry or the forest crop as needing and deserving more attention than we are at present giving it.

NEW FORESTRY LEGISLATION.

The following new legislation was enacted by the last General Court.

Law relative to setting Fires in the Open Air.

The law relative to setting fires in the open air was amended at the last session of the General Court so as to apply to all cities and to such towns as accepted the provisions of the act at a meeting of the voters called for that purpose. The time at which such permits are necessary was also changed, as so to include the month of March. The law as now in force is as follows: —

CHAPTER 209.

AN ACT RELATIVE TO THE SETTING OF FIRES IN THE OPEN AIR.

Be it enacted, etc., as follows:

SECTION 1. It shall be unlawful within any city, or within any town which accepts the provisions of this act, for any person to set a fire in the open air between the first day of March and the first day of December except by the written permission of the forest warden, or the chief of the fire department or, in cities that have such an official, the fire commissioner: *provided*, that debris from fields, gardens and orchards, or leaves and rubbish from yards may be burned on ploughed fields by the owners thereof, their agents or lessees; and *provided, further*, that persons above eighteen years of age may maintain a fire for a reasonable purpose upon sandy or barren land, if the fire is enclosed within rocks, metal or other non-inflammable material. In every case such fire shall be at least two hundred feet distant from any forest or sprout lands, and at least fifty feet distant from any building, and shall be properly attended until it is extinguished. The forest warden shall cause public notice to be given of the provisions of this section, and shall enforce the same. Whoever violates the provisions of this section shall be punished by a fine of not more than one hundred dollars, or by imprisonment for not more than one month, or by both such fine and imprisonment.

SECTION 2. Said chapter two hundred and nine is hereby further amended by striking out section four and inserting in place thereof the following: — *Section 4.* The state forester and forest warden, or any duly authorized assistant in the employ of the state forester, or any duly appointed deputy forest warden, may arrest without a warrant any persons found in the act of setting or maintaining a fire in violation of the provisions of this act.

SECTION 3. Said chapter is hereby further amended by striking out section five and inserting in place thereof the following new section: — *Section 5.* The selectmen of every town may submit this act to the voters for their acceptance at any annual or special town meeting. The vote shall be taken by separate ballot, and shall be "Yes," or "No" in answer to the following question printed upon the ballot: "Shall an act passed by the general court in the year nineteen hundred and eight, entitled 'An Act to provide for the protection of forest or sprout lands from fire,' be accepted by this town?" A majority vote of the legal voters present and voting at such meeting shall be required for the acceptance of this act; and upon such acceptance the provisions of section twenty-four of chapter thirty-two of the Revised Laws shall cease to apply to any town which has previously accepted that section.

SECTION 4. Section eleven of chapter two hundred and eleven of the Revised Laws is hereby repealed.

SECTION 5. This act shall take effect upon its passage. *Approved April 6, 1911.*

Rulings.

As the validity of this law has been doubted by some people on technical grounds, I desire to call attention to three cases which have been brought before the courts of the Commonwealth during the past season, and the disposition made of them.

Soon after the act was amended by the Legislature, a fire was set by a man in Boxford without a permit, which got beyond his control, and not only burned over a large area of valuable forest land, but cost the lives of two men who were working to suppress it. The party who set the fire was arrested and brought before the court at Haverhill, where his counsel attempted to have the case *nol prossed* on the ground that while the town of Boxford had accepted by vote the provisions of the act of 1908, it had failed to take any action on the amendment of 1911; consequently his client could not be held criminally liable. Judge Ryan, who presided over the case, heard the evidence, and then reserved his decision for a week in order that he should have ample time to consider the case thoroughly, at the end of which time he adjudged the defendant guilty, and imposed a substantial fine.

Another case, identical with the above, was brought before Judge Burke at Pittsfield. In this case the defendant was fined \$20; he appealed to the higher Court, where the verdict of the lower court was sustained, although the fine was reduced to \$15.

The third case was one brought before Judge Field at Greenfield. In this case the defendant was dismissed.

In order to have the construction of the law settled, the State Forester asked the Attorney-General's opinion, which was rendered on Dec. 18, 1911.

Attorney-General's Opinion.

BOSTON, Dec. 18, 1911.

F. W. RANE, Esq., *State Forester.*

DEAR SIR:— You submit for my consideration certain questions with regard to the construction of St. 1908, c. 209, as amended by St. 1911, c. 244. Your first inquiry is as follows:—

Does the act of 1911 (chapter 244), which struck out section 1 of chapter 209 of the Acts of 1908, substituting a new section therefor, make it necessary for towns that had accepted the act of 1908 to accept the amendment of 1911, or is the amended act operative in such towns without further action?

St. 1908, c. 209, was entitled "An Act to provide for the protection of forest or sprout lands from fire," and provided in section 1 that in a town which accepted its provisions or had accepted corresponding provisions of earlier laws no fires should be set in the open air between the first day of April and the first day of December, except by the written permission of the forest warden, except that debris from fields, gardens and orchards, or leaves and brush from yards, might be burned on ploughed fields by the owners, their agents or lessees, provided such fire was at least 200 feet from any forest or sprout lands, and was properly attended until it was extinguished. Section 5 provided that the selectmen of every town should cause the act to be submitted to the voters for their acceptance at the next annual meeting of the town after the passage thereof; and that a majority vote of the legal voters present and voting at such meeting should be required for its acceptance. These sections were amended by St. 1911, c. 244. Section 1 repealed the whole of the first section of the earlier act and substituted in its place a provision that —

It shall be unlawful within any city, or within any town which accepts the provisions of this act, for any person to set a fire in the open air between the first day of March and the first day of December except by the written permission of the forest warden, or the chief of the fire department or, in cities that have such an official, the fire commissioner: . . .

This section was substantially similar to the section struck out, but contained the additional exception that persons above eighteen years of age might maintain a fire for a reasonable purpose upon sandy or barren land if the fire was enclosed within rocks, metal or other non-inflammable material, and was otherwise slightly changed in phrase therefrom. Section 3 of chapter 244 repealed section 5 of the earlier act and substituted therefor the following new section:—

The selectmen of every town may submit this act to the voters for their acceptance at any annual or special town meeting. The vote shall be taken by separate ballot, and shall be "Yes" or "No" in answer to the following question printed upon the ballot: "Shall an act passed by the general court in the year nineteen hundred and eight, entitled 'An Act to provide for the protection of forest or sprout lands from fire,' be accepted by this town?" A majority vote of the legal voters present and voting at such meeting shall be required for the acceptance of this act; and upon such acceptance the provisions of section twenty-four of chapter thirty-two of the Revised Laws shall cease to apply to any town which has previously accepted that section.

I am of opinion that the amendments so enacted do not disclose any intention upon the part of the Legislature to require an additional acceptance thereof from towns which had accepted the statute amended. Where an act, the operation of which in any particular municipality or division of government is conditioned upon acceptance by such municipality or other division of government, has been accepted, it becomes a law, and, apart from questions affecting the constitutionality of the subject-matter

of an amendment, may be amended or repealed at the pleasure of the Legislature. It follows, therefore, that the amendment of 1911 is applicable to all towns which had accepted St. 1908, c. 209, without further action by such towns.

Your second inquiry is as follows:—

Does the provision in section 1, which allows the burning of debris, leaves and rubbish from fields and orchards, when 200 feet from sprout land or 50 feet from a building remain in force throughout the year? Does that provision apply to all towns, or only those that have accepted the act?

The provision to which your second question is directed, that "debris from fields, gardens and orchards, or leaves and rubbish from yards may be burned on ploughed fields by the owners thereof, their agents or lessees," is an exception from the restriction upon the setting of fires between the first day of March and the first day of December, contained in the same section, and it follows, therefore, that an owner, agent or lessee may at any time during the year burn debris from fields, gardens and orchards or leaves and rubbish from yards on ploughed lands, provided that such fire shall be at least 200 feet distant from any forest or sprout lands and at least 50 feet distant from any building, and shall be properly attended until it is extinguished. Whether or not during the period from the first day of December to the first day of March fires may be set which do not in all respects comply with the provisions referred to, your question does not require me to decide. Since St. 1908, c. 209, as amended by St. 1911, c. 244, has the force of law only in towns which have accepted or may accept its provisions, it follows that the particular restriction with respect to setting of fires does not apply to all towns, but only to those which have accepted the act.

Your third inquiry is as follows:—

Does the striking out of sections 4 and 5 of the act of 1908 and substituting new sections affect in any way the application of the law in towns that have accepted the act?

St. 1908, c. 209, § 5, permitted an acceptance of its provisions only "at the next annual meeting of the town after the passage of this act," to wit, at the next annual meeting after March 14, 1908. The obvious purpose of the amendment contained in St. 1911, c. 244, § 3, is to provide that the question may be submitted to towns which did not avail themselves of the provisions contained in the earlier statute, "at any annual or special town meeting." There is nothing in its language which discloses any intent upon the part of the Legislature to require towns which had already accepted the provisions of the earlier act to reconsider the question.

Very truly yours,

JAMES M. SWIFT,
Attorney-General.

Law providing for Better Forest Fire Protection.

What is considered by many to be the most valuable piece of legislation relating to forestry that has been enacted for many years is the law which empowered the State Forester to appoint an assistant to have charge of the forest fire problem in Massachusetts, aided by an efficient corps of deputies. The work already accomplished under this law is extremely gratifying, and, with the system and organization planned for next season put in operation, will without doubt result in reducing very materially the losses we have annually suffered from forest fires. The following is the law in full:—

CHAPTER 722.

AN ACT TO PROVIDE FOR THE BETTER PREVENTION OF FOREST FIRES.

Be it enacted, etc., as follows:

SECTION 1. The state forester is hereby empowered to appoint an assistant to be known as the state fire warden, whose special duty it shall be to aid and advise the forest wardens and their deputies in towns and the municipal officers exercising the functions of forest wardens in cities, in preventing and extinguishing forest fires and in enforcing the laws relative to forest fires, and may from time to time designate not more than fifteen deputies to aid such state fire warden in the discharge of his duties.

SECTION 2. The state fire warden appointed under the terms of section one shall report annually upon his work and upon the forest fires occurring in the commonwealth, and his report shall be included in and be printed as a part of the state forester's annual report.

SECTION 3. The deputies of the fish and game commissioners shall report to the state fire warden the situation and extent of any forest fire occurring within the district to which they are assigned, and they shall report to him monthly their doings under chapter two hundred and ninety-nine of the acts of the year nineteen hundred and seven.

SECTION 4. The sum of ten thousand dollars is hereby appropriated to carry out the provisions of this act during the year nineteen hundred and eleven.

SECTION 5. This act shall take effect upon its passage. [Approved July 18, 1911.]

Constitutional Amendment relative to the Taxation of Wild or Forest Lands.

The desirability of a change in the method of taxing forest lands in Massachusetts was clearly shown by the report of a special committee appointed in 1905 to investigate the subject, and the

benefits to be derived from a system less burdensome than that now in vogue have been pointed out by the State Forester many times in his annual reports. His Excellency Governor Foss, in a special message, urged upon the Legislature of 1911 the importance of giving this question prompt and serious consideration. He recommended a constitutional amendment which would enable the General Court to enact such legislation relative to the methods of taxing wild or forest lands as will serve best to encourage the development of forestry in the Commonwealth. The following resolve, based upon the Governor's message, was passed by both branches of the Legislature:—

RESOLVE TO PROVIDE FOR AN AMENDMENT OF THE CONSTITUTION RELATIVE
TO THE TAXATION OF WILD OR FOREST LANDS.

Resolved, That it is expedient to alter the constitution of the commonwealth by the adoption of the subjoined article of amendment; and that the said article, being agreed to by a majority of the senators and two thirds of the members of the house of representatives present and voting thereon, be entered on the journals of both houses, with the yeas and nays taken thereon, and be referred to the general court next to be chosen; and that the said article be published, to the end that if agreed to in the manner provided by the constitution, by the general court next to be chosen, it may be submitted to the people for their approval and ratification, in order that it may become a part of the constitution of the commonwealth.

ARTICLE OF AMENDMENT.

Full power and authority are hereby given and granted to the general court to prescribe for wild or forest lands such methods of taxation as will develop and conserve the forest resources of the commonwealth.

SENATE, July 6, 1911.

The foregoing article of amendment is agreed to, a majority of the senators present and voting thereon having voted in the affirmative; and the same is referred to the general court next to be chosen.

ALLEN T. TREADWAY, *President*.

HOUSE OF REPRESENTATIVES, July 13, 1911.

The foregoing article of amendment is agreed to, two thirds of the members of the house of representatives present and voting thereon having voted in the affirmative; and the same is referred in concurrence to the general court next to be chosen.

JOSEPH WALKER, *Speaker*.

The passing of the foregoing legislation by the present General Court is believed to be of great importance by the State Forester. In order to give the State Forester's opinion more in detail, the following letter is published, which was alluded to in Governor Foss's message: —

Governor EUGENE N. FOSS.

DEAR SIR: — In reply to your request for a statement of my opinions concerning forest taxation in this State, I submit the following: —

Of the Massachusetts 5,400,000 acres, as far as I am able to ascertain practically three-fifths, or at least 3,000,000 acres, are better adapted to forestry than any other purpose. We have a naturally rolling country, and from its geological formation much of our lands are either hilly, rocky, mountainous, sandy or moist, so that they are unadapted for general agriculture. These same lands, however, were originally covered with splendid stands of primeval forests, and under modern methods of management we have every reason to believe can be made a great fundamental asset to the State's future.

We have in Massachusetts a natural forest country. From a study of the white pine as found growing naturally in the State, we have statistics in the State Forester's office that show very conclusively that were we able to keep our lands adapted to forests, growing this species alone, the average annual increment of growth would range from 751 feet board measure under slow-growing conditions to 1,130 feet under fast-growing conditions for each acre. The above data were for yearly averages of fifty-year growth stands.

When we realize that at present white pine averages from \$6 to \$12 per thousand for stumpage, one can appreciate what values are possible in even a small State like Massachusetts if properly regulated. What is true of the white pine is more or less true of other forest species. The above data are taken from natural conditions.

It is well known by foresters that under modern methods of forestry management, like that pursued by the Germans, greater yields can be depended upon. From our present knowledge of forest production, and its bearing upon Massachusetts, we believe it a conservative statement to say that were we able to control forest fires, insect and disease depredations, and to practice modern forestry management, we could expect the average yearly income to the State at present prices to range from \$10,000,000 to \$25,000,000. We are reasonably sure, as well, that future prices of forest products will be much higher than at present.

The conditions of our present forest taxation are extremely elastic. In many towns the tendency is to place a heavy valuation on timber lands, while here and there we find that little change has been made for a number of years, although the true valuation has greatly increased. Instances are shown where forests have been taxed at a nominal sum until pur-

chased at a fair price, and then the valuation is raised, in some instances to an advance of 60 per cent.

The tendency at present is to increase valuations on forest lands more than formerly, as good growth is scarce, and if assessors tax it at its real value, according to law, owners at once realize the burden and are driven to cut it down. If these conditions applied to mature growth the objection would be slight, but our old growth is largely cut, and the burden comes on young and immature growth that from every economic standpoint, including that of rational taxation, should not be cut.

The objectionable feature to our present system is the taxing of the growing crop as well as the land. Growing agricultural crops are not taxed. The forest is nothing other than a growing agricultural crop, only that the crop of each additional ring on the trees or increment cannot be harvested without destroying the possibilities of future crops or values, and hence remains dormant until the totals of several seasons are taken together. Were it not for this fact the growth of each year would not be taxed any more than other agricultural crops. Therefore, just because there is in a tree crop an accumulation of annual growing crops, which from the nature of the case is necessarily standing idle to ensure the succeeding annual growing crop on the same land, it should not be taxed.

Farm lands are assessed at a fair average figure per acre, depending upon their productivity of crops, and, as above stated, the crop is not taxed. Why not tax forest lands, or even depleted and neglected lands capable of growing forests, of which there are many throughout the State, at the rate of their annual possibilities of productivity, the same as agricultural lands are now taxed? This would determine a basis of yearly permanent taxation on which the towns and State could depend. It would go farther; it would establish a definite policy whereby one could be assured of a reasonably certain policy in dealing with forest properties.

Our present law, if enforced by conscientious assessors, results in premature harvesting of the crop, as not only is the growing annual crop taxed, which in itself would not be so objectionable, even if other agricultural crops are exempt, but this growing crop is again taxed year after year when it is standing idle, and this fact is distinctly burdensome to modern forestry development.

A point I wish to emphasize relative to the importance of having a well-regulated State forest policy, which is impossible with our present uneven taxation law, is that modern forestry encouraged is bound to return an industry to our rural communities, the lack of which is already experienced at the present time.

It was only a few years ago when every farming district was equally busy in winter as throughout the growing season, utilizing its hired help and teams in the wood lot, getting out saw logs and lumber; not stripping the land, but taking out the ripe trees suitable for lumber, and carrying on a rotation of crops in the forests as it were. The farmer had an industry to follow in the winter as well as in the summer. At present the depleting, or run-out at the heel, forestry conditions, once so thrifty, have, through

improper culture, left many a rural town without a winter occupation. The hired help which once the farmer was able to retain throughout the whole season is lost during the present winters, and even the horses and oxen are "eating their heads off," instead of being needed for the accustomed purpose of industry. A more rational taxation of forests, I believe, will have a tendency to better the whole rural life problem.

I came to Massachusetts as State Forester the year following the report of the committee of 1905, which was appointed by the General Court to consider the laws relative to the taxation of forest lands. After studying the report, and looking into the matter quite fully, I became convinced that the whole question was one of larger importance, namely, that before we could arrive at the problem satisfactorily from the forestry standpoint, it would be necessary to be able to classify the forestry properties in such a manner as to render practical results. This, I found, is not allowable according to the State Constitution, and it was for this reason that I took the position that I did before the taxation commission, which reported in December, 1909.

Respectfully submitted,

F. W. RANE,
State Forester.

APRIL 26, 1911.

EXPENDITURES AND RECEIPTS.

In accordance with section 6, chapter 409 of the Acts of 1904, as amended by section 1, chapter 473 of the Acts of 1907, the following statement is given of the forestry expenditures for the year ending Nov. 30, 1911:—

Salaries of assistants,	\$5,335 70
Traveling expenses,	741 73
Stationery, postage and other office supplies,	593 93
Printing,	159 92
Nursery account,	3,075 28
Sundries,	119 28
	<hr/>
	\$10,025 84

Reforestation Account.

Labor,	\$5,679 54
Land,	675 00
Trees,	2,048 23
Tools,	323 08
Travel,	767 68
Express,	417 91
Sundries,	83 63
	<hr/>
	\$9,995 07

Forest Fire Prevention.

Salaries,	\$3,440 27
Travel,	2,287 02
Printing,	378 80
Stationery, postage and other office supplies,	468 92
Express,	34 59
Equipment,	2,461 67
Sundries,	52 47
	<hr/>
	\$9,123 74

Reimbursements to towns for fire-fighting apparatus, . . \$3,424 54

PART II.

MOTH WORK.

PART II.

GYPSY AND BROWN-TAIL MOTH SUPPRESSION.

IN GENERAL.

The moth work has been under the supervision of your State Forester for the past three seasons. It has been his constant aim to perfect a "live-wire" organization. The department has received \$300,000 a year for the State work and \$15,000 a year extra for parasite work. This last sum has been largely expended under the direction of the United States government. For the expenditure of the \$300,000 each year for the past two years statements have been made in previous annual reports, and the results of the present season are given in the following pages.

The expenses for supervision of moth work in two years were reduced from \$92,000 to \$36,000, and we believe the work is more efficient than ever.

What has been saved in supervision has enabled the department to do just so much more in cities and towns. With modern conveyances, as with the motor cycle and automobile, the whole problem of better supervision and methods has been solved. The improved spraying machinery and general equipment have revolutionized former practices, as the cost of woodland spraying alone was reduced from \$40 to about \$6.50 an acre. The burlap method of treatment is practically a thing of the past, except in certain cases. The same amount spent for spraying that was allowed for labor and burlap proves more effective in combating the moths.

At present we have a more definite State policy. The co-operative understanding between the State forces and the United States government officials is much improved, and it is believed promises well for the future. Since the enactment of the law giving the

State Forester the power of approval of local moth superintendents the personnel has greatly improved, and their degree of responsibility has increased.

Taking the above conditions under consideration, it is believed that we may now begin gradually to curtail the present State appropriation.

The State Forester presented a paper entitled "The Gypsy and Brown-tail Moth Situation," before the Society for the Promotion of Agricultural Science recently, and as the conclusions may prove of interest they are given, as follows:—

THE FUTURE OF THE MOTH WORK.

To predict the future of the moth work I realize is like delving almost into the unknown.

Our people in Massachusetts are great lovers of trees, and forestry particularly appeals to them. Wherever I go, however, since the moth work has been placed under my supervision, usually the question asked me is, "What are the prospects for the control of the gypsy moth?"

A few of the conditions I desire to call attention to at present are:—

(1) Massachusetts has been the unfortunate territory in which these moths have first established themselves. She can in no way be blamed for their existence, any more than Michigan can be held responsible for the dread hoof and mouth disease, or the south be blamed for the outbreak of the cotton boll weevil or the hook worm. We are to be commiserated rather than blamed, for it has been and is yearly a great expense to our people. We have had sad experience in the past by giving up the work once, when it might have been kept under control at relatively small expense, and that experience it is believed is not without value.

(2) We in Massachusetts, I am inclined to believe, are in a better condition as regards the future than many of our sister States. We are in a position to cope with the situation, while New Hampshire and Maine, for example, have been comparatively inactive. If you will examine the map showing the infested territory, it is easily seen that the moth is advancing rapidly elsewhere than in Massachusetts. New Hampshire has fully as much infested territory, if not more, than we have. Massachusetts is getting the moth work well in hand in many of her towns and cities, and if her people continue to stand by the work, we shall have ere long many cities and towns whose liability under our State law will make them self-supporting. When a city or town has once reached this condition it should be compelled to keep the work up, as it will require but a small annual expenditure.

(3) Massachusetts, even with her heavy expenditure, has been unable thus far to prevent the gradual spread westward. We have, however, greatly checked the advance, and with our present methods it will be



The standard improved power sprayer, planned and built by the State Forester.



A close view of the newly invented power-truck sprayer. Same power as the above, but does away with horses and driver, and the engineer becomes the chauffeur. Tank and pump are easily removed and the truck then is used the same as any truck.

several years before the Berkshires are likely to become generally infested. Meanwhile we shall hope to keep it confined to Worcester County.

(4) In New Hampshire, our sister State to the north, the infestation is known to be very general, so that the moths are likely to flank us on the north, and sweep down upon our beautiful Berkshires. Already the gypsy moth has reached the boundaries of the Connecticut watershed in New Hampshire, and the brown-tails are in the valley itself. Under these conditions does it not stand to reason that it is only a matter of a comparatively short time when they will, through natural conditions, invade Vermont, and follow down the Connecticut valley into Massachusetts, and thence into Connecticut? If once these conditions are fulfilled, how, may I ask, can we ever expect to keep them out of New York and the Adirondacks, and if once there, then throughout the country?

(5) After studying the evidence I have placed before you I should be pleased to have you determine in your own minds whether we do not have a national issue before us rather than a State one. While the national government is appropriating \$300,000 a year at the present, this is far less than Massachusetts alone is now spending. It is feared that the government has not comprehended the situation fully, or more vigorous measures would have been taken years ago.

Massachusetts, from her long and varied experience, can give plenty of good advice. The work that actually shows results is the practicing of modern forestry combined with other well-known methods, such as spraying, as already suggested. For example, see what Colonel Sohier and the residents along the renowned North Shore have accomplished in co-operation with the State. The United States government can afford to do the work in this way. Many of the New England States cannot, and thus will not be able to cope with the problem.

The question resolves itself down to this, whether it is expedient for the national government to handle the problem now, while it is comparatively a simple one, or run the chances of being compelled to do so at a great expense later on.

(6) We are all extremely anxious and desirous that the results from parasites, predaceous beetles, diseases, protozoa, climatic conditions, etc., may one or all prove to be the great panacea, but nothing thus far has shown the degree of efficiency that we desire.

The State of Massachusetts, as I have already stated, has welcomed every possible assistance, and is at the present time co-operating in furthering every line of investigation that has promise in it.

(7) In spite of all that has been written and claimed for the parasite work, we must realize that it is still in the experimental stage. No one anticipated results more than the writer, and it seems self-evident that if we can get the natural enemies once established in this country they will do the desired work. The more we study the question, however, the more problematic it seems. It is now conceded by our best experts, and Professor Kincaid in particular, that we must not look for any one insect

to do the work, but that, as in Japan and elsewhere in nature, it requires a natural sequence of parasites which will attack the moths in the different stages of transformation to keep the host under control.

What is true of parasitism may prove equally true of the diseases. We have very encouraging results from both lines of investigation this year and the work must be continued.

Had we depended upon native parasites, as was advocated by some in the earlier days, I wonder what conditions our trees and forests in Massachusetts would be in to-day. In a few instances it was tried with sad experience.

I am sure that we all will hail the time when these obnoxious pests shall be under control.

PRIVATE PROPERTY PROBLEM.

By the provisions of the law under which the work of suppression is now being carried on under the direction of this office in cities and towns, a considerable amount of work on private estates, where the owner or owners neglect to do the same, has to be done by the local officials. The amounts charged for this work are collectible by the city or town, and the total amount in each town or city is submitted to this office, to be deducted from the gross expenditure in the case of cities or towns which are receiving State reimbursement. It oftentimes occurs that there is misunderstanding in the submitting of the amount charged to property owners, and this has caused this office considerable trouble in the past. We have received numerous complaints from property owners stating that they were wrongly charged with work, and that the city or town employees never were on their estates, or that they only have two or three trees, and various other complaints. We have now issued, instead of a triplicate book for charging private work, a book containing four sheets, one of which is to be sent to this office; that is, the local superintendent is to make out the four sheets at one time, and send the sheet marked "to be returned to the State Forester" to this office. These are to be sent at least once a week. These sheets are all numbered, and the local moth superintendent, when any numbers are skipped, must make an explanation of the same, as the sheets will be checked up in this office, and all missing numbers must be accounted for. Also, it sometimes happens that the property owner is not charged as much as he should be, on account of the local superintendent not having a thorough knowledge of what the work is worth, and

by having this charge slip returned to this office we shall be able to make a thorough examination of all town charges, and we shall also be able to check the amount of private work which has been charged in each fiscal year. It has been a great handicap to this office not to know the amount which has been charged to property owners at a time during the year when the town is very much in need of such reimbursement as may be due it.

The black record books, also, should be made up, giving the property owners in each city or town, with their liability under the law, and these should be in the custody of the foreman or local superintendent, so that when entering any estate he may know the owner's liability, and not expend too large a sum on estates where the liability is very small, and where it will not pay for but a small percentage of the work. This is necessary in the greater number of the cities and towns receiving reimbursement for the past five years, where private property should be on a self-supporting basis. If there are any places in any city or town which are not at the present self-supporting it is necessary that some co-operative arrangement be made to put such estates in a condition where the owner's liability will pay for all necessary work in the future.

It has often been said that the expense of making up a record book, showing the owner's liability, is an unnecessary one, but we believe that the small expense which any city or town will be put to in having this book properly made up will be greatly offset by the economy which may be shown by the local superintendent, or foreman, in charge of any gang of men, while doing work on private estates. It must also be thoroughly understood by all of the local forces that the amount which the property owner is to pay is determined by a section of the law under which they are now working, and is reckoned as one of the sources of revenue by means of which this work is carried on. It is therefore necessary that the gross amount should be charged where the work warrants it.

AUTO TRUCK SPRAYER.

Roadside spraying has at all times been considered an important feature of moth suppression work by preventing distribution, and the amount of this work has steadily increased from year to year. Taking into consideration the limited time during which

effective spraying can be accomplished, the State Forester had built a power truck sprayer with which it is possible to spray both sides of the highway at the same time while traveling.

One of the serious drawbacks, heretofore, with this type of spraying has been the time occupied in going after and returning with a load of water. In many cases the distance traveled is over 5 miles, which would require, with a horse-drawn machine, over an hour and a half, while only nineteen minutes was occupied in making a round trip of 4.8 miles with this machine, and drafting from a brook 400 gallons of water.

Again, the advantage of this outfit to a city or town is that when the spraying season is over the spraying attachment can be removed and replaced by a regular truck body, thereby converting the same into a 3-ton auto truck which may be used by other departments as well, thereby greatly reducing the cost of teaming.

SUPPLY STORE.

For the past two years we have been shipping supplies through our supply store to the various cities and towns, receiving reimbursement from the State, and have met with very good success. The work can be simplified at our supply store, however, if the local superintendents will be more careful in submitting orders on all articles of hardware. That is, those supplies which are used during the entire year more or less should not be ordered in small quantities; they should be ordered in large enough quantities to last through the year. For instance, in ordering rivets and plugs for climbing irons, it is not economy to order one pair; no less than six pairs of such articles as these should be ordered. This will make our shipping easier and more economical, and simplify the checking of accounts to a great extent. Also, during the past season many errors occurred when submitting orders in giving the wrong number of the article on the order, the result being that the local superintendent has received the wrong supplies. These orders should be very carefully made up, so that when goods are once shipped they will be correct.

We should be glad at any time when the supplies are not perfectly satisfactory to receive complaints at this office at once, so that we may investigate the same without any delay, and if it is possible to improve our supplies, do so at once.

Supplies have been furnished to the following cities and towns:—

LIST OF TOWNS RECEIVING SUPPLIES AND THE AMOUNTS.

Acton,	\$169 40	Lynnfield,	\$452 33
Andover,	1,470 82	Marshfield,	209 85
Arlington,	1,096 62	Mashpee,	95 99
Ashburnham,	1 88	Maynard,	26 23
Ashby,	25 37	Medford,	1,436 07
Ashland,	38 60	Merrimac,	107 84
Avon,	59 63	Methuen,	2,301 56
Bedford,	2,028 38	Middleborough,	2,144 57
Belmont,	15 10	Middleton,	104 13
Berlin,	152 24	Milton,	3,921 85
Billerica,	474 53	Natick,	499 11
Bolton,	81 44	Needham,	547 36
Boston,	61	Newbury,	358 17
Boxborough,	114 00	Newton,	9,496 96
Boxford,	508 09	North Andover,	318 37
Brookline,	69	North Reading,	812 66
Bridgewater,	3 45	Norwell,	2,600 19
Burlington,	303 51	Pembroke,	97 55
Canton,	93 45	Pepperell,	85 79
Carlisle,	644 77	Plympton,	85 79
Carver,	46 65	Raynham,	45 90
Charlton,	1 25	Reading,	1,698 14
Chelmsford,	2,130 49	Rockport,	1,850 11
Cohasset,	804 40	Rowley,	315 22
Concord,	1,380 75	Salisbury,	226 04
Danvers,	1,036 95	Sandwich,	17 40
Dracut,	146 43	Saugus,	1,083 44
Dunstable,	102 39	Scituate,	618 83
Duxbury,	69 56	Sherborn,	120 19
East Bridgewater,	146 55	Shirley,	68 42
Essex,	157 46	Southborough,	223 61
Fitchburg,	1 62	Sterling,	145 02
Georgetown,	358 13	Stoneham,	678 20
Gloucester,	1,825 81	Stow,	145 09
Groton,	524 42	Sudbury,	107 32
Groveland,	160 08	Tewksbury,	292 57
Halifax,	14 95	Topsfield,	348 91
Hamilton,	2,176 99	Townsend,	57 70
Hanover,	107 09	Tyngsborough,	303 50
Hanson,	100 47	Wakefield,	887 23
Harvard,	173 14	Waltham,	1,054 13
Haverhill,	2 04	Wayland,	952 13
Hingham,	10 48	Wenham,	731 72
Hudson,	3 93	West Bridgewater,	66 20
Ipswich,	744 99	West Newbury,	288 15
Kingston,	59 85	Westford,	1,972 91
Leominster,	1 80	Weston,	3,028 86
Lexington,	2,520 52	Wilmington,	1,078 44
Lincoln,	1,722 82	Woburn,	3,306 59
Littleton,	176 64	Worcester,	35
Lowell,	149 51		
Lunenburg,	71 47		
			\$71,360 10

Experimental work, Concord,	\$3 84
Forest fire work,	3 75
Massachusetts Highway Commission,	259 69
North Shore work,	19,224 03
Parasite work,	236 56
Reforestation work,	20 52
Salem Cadet grounds, Boxford,	30 84
South Shore work,	2,544 10
Traveling pump,	318 76
Traveling sprayer, Cape Cod,	224 50
Traveling sprayers, (2 and 8),	184 46
Traveling sprayer, (4),	50 50
Traveling sprayer, Andover, etc.,	23 60
Traveling sprayer, Burlington, Pine Banks,	197 28
Traveling sprayer, Pepperell,	2 61
Traveling sprayer, Weston,	69 21
Total,	\$95,024 35

PARASITE WORK.

REPORT OF DR. L. O. HOWARD, CHIEF OF THE BUREAU OF ENTOMOLOGY,
WASHINGTON, D. C.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY, WASHINGTON, D. C., Dec. 15, 1911.

Prof. F. W. RANE, *State Forester, Boston, Mass.*

DEAR SIR: — In accordance with your request I submit the following brief report on the operations carried on co-operatively between the Bureau of Entomology, United States Department of Agriculture, and your office in the effort to import and acclimatize the natural enemies of the gypsy moth and the brown-tail moth.

Respectfully yours,

L. O. HOWARD,
Chief of Bureau.

Some innovations have been made during the past year in the course of this work, and additions have been made to the force, until during the last summer no less than 37 men were employed to carry on the work at the laboratory and make necessary investigations in the field. The importation of the winter nests of the brown-tail moths has been discontinued, since it was found in 1910 that all of the species of parasites which could be secured from such nests had already been brought over and liberated. Observations made the past summer have indicated that this course was fully justified, and we have found that all of the parasites which were introduced in this way during previous years have established themselves, and have dispersed over the infested territory in a very satisfactory manner.

The present range of many of the introduced species has been followed and mapped, and some extraordinary instances of dispersion have been found. For example, *Monodontomerus æreus*, which attacks the gypsy and brown-tail moths in the pupal stage, is now to be found practically over the whole of eastern Massachusetts, in several towns near Providence, R. I., through the southern part of New Hampshire, and into eastern Maine to a point nearly to Bangor. Another species, the *Pteromalus egregius*, referred to in previous reports, and which destroys the brown-tail caterpillars in the winter web, has been found in small numbers over a widely scattered area in Massachusetts, New Hampshire and Maine. Two other species have greatly increased their range; these are *Apanteles lacteicolor* and *Meteorus versicolor*. Two of the tachinids have been recovered this year for the first time. The *Calosoma* beetle has shown a notable increase, and in the whole infested section where it has been found abundantly during the present season, enormous inroads have been made on the gypsy moth caterpillars and pupæ, and in some cases it has been difficult to collect pupæ even in areas that were quite badly infested in the early summer, this result being due entirely to the good work done by this beetle, which will obviously become a powerful force in helping to hold the gypsy moth in check.

A very encouraging feature of the summer's work has been the recovery in large numbers of the Japanese egg parasite of the gypsy moth, known as *Schedius kwanæ*. This insect, reared two years ago in enormous numbers in confinement, was liberated in great quantity. At one time it appeared as though it was lost, and would not stand the New England winter. During the autumn of the present year, however, field observations showed that it has practically become established, and that in some localities 30 per cent. of the eggs in a given mass had been destroyed by it. Another egg parasite, the *Anastatus*, is reproducing very satisfactorily under natural out-of-door conditions. Its spread is slow, and it does not develop in large numbers rapidly as it has only one generation a year.

Of the new importations of the year, a tachinid fly, known as *Eudoromyia magnicornis*, has been brought over in large numbers. Seven thousand specimens have been liberated this year.

One of the innovations of the year was not to rely so much on foreign agents, but to send one of our own best men to do active field work. Mr. W. F. Fiske, in charge of the gypsy moth parasite laboratory at Melrose Highlands, Mass., was placed in southern Italy, and remained there until July, Mr. A. F. Burgess being left in charge of the laboratory. Mr. Fiske's efforts were very successful indeed, and he sent over in large numbers four species parasitic on gypsy moth caterpillars, and another one which attacks gypsy moth pupæ. Practically all of them arrived in excellent condition, owing to the superior manner in which they were packed and shipped. Of one of the species, Mr. Burgess was able to liberate 23,000 adults; of another, 10,000.

Partly as the result of the excellence of Mr. Fiske's work in Italy and

of the growing appreciation of the desirability of studying gypsy moth conditions, particularly in relation to parasitism, in the native home of the species, with the expectation of getting practical information of value, and perhaps of being able to import parasites which have not yet been received, and of which even existence has not been suspected, Mr. Fiske has been sent back to Europe and will be given two or three American assistants. The winter will be spent in locating places where the gypsy moth may reasonably be expected to be more or less abundant during the coming season, and other places where it may seem desirable to work during the early summer. It is hoped and expected that the results of this expedition will fully justify the expense.

THE WILT DISEASE.

Experiments have been carried on with what is known as the gypsy moth wilt disease for the past two years, and last season it was believed that some very good results had been obtained in several places. We have a representative from this office canvassing the cities and towns where bad infestations occur, and making arrangements for plantings of this disease in quantities on large areas the coming season. The disease work will be prosecuted on a much larger scale the coming season than ever before, so as to determine as certainly as possible what results we can hope for from the same. Material for plantings will be plentiful, as arrangements are now being made to have a very large amount on hand at the time when needed. It is hoped that the local superintendents will give as much time as they can to watching the developments of this disease, and make a very careful report as to its effects, whether a success or a failure. It is very necessary that these reports be authentic, as much depends upon them for future work along this line. The diseased material will probably be delivered to towns through our district superintendents, or other representatives of this office, so that it may be in the best of condition for planting. Special instructions in the planting of this material can be had at this office on application. This material should not be planted in residential sections. It should be used mostly on wooded areas for the next season, until more definite results can be determined.

Dr. W. M. Wheeler of the Bussey Institute of Harvard University and his assistant, Mr. William Reiff; have co-operated with the State Forester throughout this year as last. Mr. Reiff had charge of the greenhouse work whereby material was bred and dissemi-

nated in the early season, and he supervised the work throughout the year. Mr. Reiff is now in Germany studying the disease, and will return early in the year to take up the work again on a more extensive scale, as indicated above.

The bulletin on this subject written by Mr. William Reiff and published by this department has been of much assistance in educating our people as to the importance of this work in controlling the gypsy moth.

THE FUNGUS DISEASES OF THE BROWN-TAIL AND THE GYPSY MOTHS.

The same arrangements that were made last year with Dean W. C. Sabine and Dr. Roland Thaxter of Harvard University have been continued throughout the past season. Mr. A. T. Speare resigned, and Mr. R. H. Colley, an assistant to Dr. Thaxter, was appointed to fill the position. Mr. Colley has under preparation a report concerning this work up to date, which will probably appear in a few months. More plantings of the brown-tail fungus have been made than ever, with apparently excellent results. The fact that the brown-tail moth is disseminated by flight makes its control the more difficult. The fungus disease of the gypsy moth is still in the experimental stage.

NORTH SHORE WORK.

The excellent work that has been carried on in recent years on the North Shore has continued in its effectiveness throughout the past season. The summer residents committees, the towns and the State Forester's department have co-operated as heretofore during the year. The State Forester is particularly under obligation to Col. Wm. D. Sohier for his unfailing public-spirited interest in the work in this section of the State.

The following is a reproduction of that portion of the summer residents committees' report that relates to the moth and forestry work: —

GYPSY MOTH AND ROAD WORK ON THE NORTH SHORE.

General Purposes.

For the fourth season your committees have done their best to preserve the forests on the North Shore, especially those directly back of the valuable shore property, and also a strip from 100 to 200 feet wide on the sides of all our beautiful wooded drives.

What was at first a theory based upon the experience of others now seems to be a demonstrated fact, and that is that with comprehensive, thorough and scientific work the woods upon the North Shore, where such work can be done, can be preserved.

Half measures are of hardly any value. To secure results all of the woodland in a given area must be well taken care of, because if any of it is left in bad condition the moths will inevitably spread on to all the surrounding land, rendering the work done there of no value.

Scope of the Work.

Therefore, your committees have continued their policy of the last two years of concentrating their efforts in preserving the woods directly back of the shore for a reasonable distance, co-operating with the subscribers where thorough work was being done by them, and only small areas remained to be done to clear up a block, and attempting to preserve a strip of woodland alongside our beautiful wooded drives. Such a strip has been cleared upon something over 30 miles of road.

Work has been done all the way from Beverly nearly to Gloucester harbor. The city of Gloucester co-operated by putting into the State treasury \$2,500 to be used in the North Shore gypsy moth work, and the State, through Governor Foss, put in an equal amount and a like sum was raised from the summer residents at Magnolia. Almost all of the work there was done on the land adjoining the sea and directly back of it and on the sides of the State highway down beyond Fresh Water Cove.

By another year, if the work is continued, we shall have nearly a continuous block of woodland cleaned up.

Parasites.

Many parasites have been put out in various places in the back woods. It is too early to say how the different kinds will thrive and what they will accomplish, but by next season we hope to see good results. The so-called wilt disease was not as prevalent this year as in former years, probably because of the dry season. It did, however, kill many caterpillars in some of the back colonies.

The parasites have all been set out in woods that were not to be sprayed and where they could develop freely. As soon as they do develop they will spread on to the adjoining property, and thereby diminish the work which has to be done to preserve the woods.

Nature of the Work.

The work has been the same this year as in former years, and consisted of clearing out the underbrush and poorer trees in order to be able to spray economically and to do thorough work in creosoting. In the bad colonies the eggs have been creosoted, in some cases the ground has been burned, and then as early in the season as possible the woods have been sprayed.

Present Conditions.

Conditions throughout the territory, as a whole, are better than they have ever been. The warm, dry season, however, made the caterpillars on some places pupate earlier than usual, and the result was that a few of the colonies have more nests now than they had last year, because it was impossible to spray them early enough in the season to kill all the caterpillars before they pupated.

Over 3,300 acres were sprayed during the season. At one time there were over twelve spraying machines actively at work.

We found that our new spraying machines were doing much more efficient and economical work than the older ones. They actually threw over the tops of the trees, and made a finer spray, and were more economical because, with their additional power, nearly double the territory could be covered in one day with the same labor cost.

How the Money was secured.

The same arrangement that has been made with the Commonwealth in former years was continued. The State Forester's department took charge of the entire work, and the following appropriations were secured: —

From the city of Beverly,	\$5,000
From the town of Manchester,	5,000
From the city of Gloucester,	2,500
From the Commonwealth of Massachusetts,	12,500
Contributed by your committees,	12,500
	<hr/>
	\$37,500

This money was all paid into the State treasury for moth work on the North Shore, to be used by the State Forester's department. His Excellency Governor Foss has at all times been interested and ready to co-operate with the efforts of your committees. Had it not been for this co-operation it seems likely that the work would have had to be discontinued, in which case our forests would have been destroyed.

The balance of the money necessary for the work was provided one-half by the Commonwealth and one-half by your committees.

Persons in Charge of the Actual Work.

The actual work was in charge of the State Forester's department, under Mr. F. W. Rane. Mr. L. H. Worthley, superintendent of the brown-tail and gypsy moth work, supervised and laid out the work, and he was most ably assisted by Mr. Saul Phillips, Mr. William A. Hatch and Mr. Walter F. Holmes. We certainly owe these gentlemen a debt of gratitude for the preservation of our woods. But for their efforts and indefatigable attention many of our forests would have been destroyed.

In the spraying season, which is all too short, the work is extremely arduous. It was no unusual occurrence for some of the men in charge

of the machines to work practically all night in order to repair a spraying machine so that it would be ready for use the next day. They realize much more fully than we do that a day's delay might mean the destruction of 10 to 20 acres of woods. They were interested in their work, and the territory was most efficiently covered by the inspectors, all of whom had motor cycles.

The Work accomplished.

Roughly speaking, about 1,000 acres of woodland were cleared and sprayed in 1908, about 2,100 acres in 1909, about 3,000 acres in 1910, and over 3,200 acres in 1911. The cost of the work is of interest, being approximately as follows:—

1,000 acres in 1908,	.	.	.	.	.	.	.	\$60,000
2,100 acres in 1909,	.	.	.	.	.	.	.	60,000
3,000 acres in 1910,	.	.	.	.	.	.	.	57,000
3,200 acres in 1911,	.	.	.	.	.	.	.	54,500

The acreage covered in 1911 was over three times that cared for in 1908, and the total expenditure somewhat smaller.

Cost of the Work.

According to the report of the State Superintendent, the cost of the work this year was as follows:—

In Gloucester 100 acres cut and burned, 171 acres creosoted and 472 acres sprayed, at a total cost of \$6,251.40.

In Beverly, Manchester and the adjoining woods 494 acres cut, burned and many of them creosoted, 1,920 acres creosoted and 2,742 acres sprayed, at a total cost of \$35,987.20 (not including plant and some materials).

Expenditures.

The expenditures this year were \$54,580, but we have on hand tools and equipment which are worth nearly \$10,000, which should be deducted from the first amount to show the actual cost of the work.

Expenditures from July 16, 1910, to July 22, 1911, .	\$35,963 96	
Cost of tools, spraying machines, etc.,	18,616 43	
	<hr/>	\$54,580 39
Value of tools and supplies on hand, . . . . .	. . . . .	9,768 33
		<hr/>
Actual cost of work, not including plant, . . . . .	. . . . .	\$44,812 06

Details of Cost of the Work.

Spraying,	\$21,532 50
Tanglefooting,	953 62
Road building,	432 75
Cutting and burning,	14,889 10
Creosoting,	6,843 33
Collecting egg clusters of gypsy moth for laboratory,	31 25
	<hr/>
	\$44,682 55

Average Cost of Work.

Spraying 3,215 acres,	\$6 70 per acre.
Creosoting 2,105 acres,	3 25 per acre.
Cutting 587 acres,	25 34 per acre.

These costs do not include tools, plant, etc., merely labor and materials.

Where work was done on private estates, which was only in the back woods, where it came in connection with other work which your committees were doing, the money is being repaid by the owners when they are able to do so.

Co-operation by the Commonwealth and the Cities and Towns.

Your committees feel that the summer residents owe a great deal to Governor Foss and his State officials, the mayor and city government of Beverly, the selectmen of Manchester, and the mayor and city council of Gloucester, for their generous help and co-operation, which alone enabled your committees to do systematic, thorough and efficient work against the gypsy moth under one responsible head, and without regard to town lines. In no other way could our forests and beautiful shore have been preserved.

It requires a large amount of pluck, as well as sound business judgment on the part of city and town officials in these days, to authorize the spending of the money in their charge by an outside committee or commissioner, or by others than town and city officials. We believe, however, that the results obtained are ample justification of their action.

A few photographs are printed herewith showing the work in progress.

Our Hopes for the Future.

Our forests can be preserved if the necessary money is provided and the work continued on the lines on which it has been begun.

Your committees hope that the subscribers, the Commonwealth and the cities and towns will co-operate in the future as they have in the past. They hope that every resident and summer resident on the North Shore who has enjoyed our woods, our trees and our dustless roads, and who has not yet subscribed or who has not yet given his fair share toward this work, will co-operate by sending a check to Wm. D. Sohier, agent, 15 Ashburton Place, Boston, Mass.

A list of the subscribers is published herewith.

WM. D. SOHIER,
For the Committees.

Beverly.

OLIVER AMES.
CHARLES H. TYLER.
WM. D. SOHIER.

Manchester.

Maj. HENRY L. HIGGINSON.
GARDINER M. LANE.
GEORGE WIGGLESWORTH.
Summer Residents Committees.

SUBSCRIPTIONS FOR GYPSY MOTH WORK ON THE NORTH SHORE, OCT. 1, 1911.

Beverly.

Henry Clay Frick, . . .	\$2,000	F. J. and Alice Cotting, . . .	\$125
Hon. Wm. H. Moore, . . .	1,000	Harold J. Coolidge, ¹ . . .	100
Wm. S. and J. T. Spaulding, . . .	500	The Misses Paine, . . .	100
William Endicott, . . .	500	The Misses Loring, . . .	100
Mrs. Chas. H. Dalton, . . .	400	Augustus P. Loring, . . .	100
Dudley L. Pickman, ¹ . . .	300	Allen Curtis, . . .	100
Col. C. N. Wallace, ¹ . . .	300	Col. C. L. Peirson, . . .	100
John L. Saltonstall, ¹ . . .	250	Charles J. Morse, ¹ . . .	100
Amory A. Lawrence, . . .	250	Mrs. E. P. Motley, . . .	100
Charles H. Tyler, ¹ . . .	250	Mrs. Nicholas Longworth, . . .	100
George S. Mandell, ¹ . . .	250	Mrs. James F. Curtis, . . .	100
Miss Fannie P. Mason, ¹ . . .	250	Francis I. Amory, . . .	100
Robert S. Bradley, ¹ . . .	250	Robert H. Bancroft, . . .	100
F. L. Higginson, . . .	250	Mrs. G. H. Shaw, . . .	100
Herbert M. Sears, . . .	250	Frederick R. Sears, ¹ . . .	100
Bryce J. Allan, ¹ . . .	250	Mrs. A. M. Kidder, . . .	100
Alexander Cochrane, . . .	250	S. Reed Anthony, . . .	100
Frederick Ayer, . . .	250	Wm. A. Gardner, . . .	100
Robert Saltonstall, . . .	250	Estate of Mrs. J. B. Silsbee, . . .	100
D. Herbert Hostetter, . . .	250	A. Shuman, . . .	100
Quincy A. Shaw Estate, . . .	250	George A. Goddard, ¹ . . .	100
Francis Bartlett, . . .	250	Hon. George H. Lyman, . . .	100
William Phillips, . . .	250	Leonard Ahl, . . .	100
Washington B. Thomas, ¹ . . .	250	James L. Paine, . . .	50
Hon. Wm. C. Loring, . . .	250	T. C. Hollander, . . .	50
Dr. Henry F. Sears, ¹ . . .	250	Gordon Dexter, . . .	50
Charles D. Sias, . . .	250	H. D. Chapin, . . .	50
Charles H. Tweed, . . .	250	Mrs. J. C. Phillips, . . .	50
Wm. D. Sohler, ¹ . . .	250	Oliver W. Holmes, . . .	50
Thomas P. Beal, ¹ . . .	200	Mrs. F. H. Peabody, . . .	50
Neal Rantoul, ¹ . . .	200	Charles K. Cummings, . . .	25
Mrs. R. D. Evans, . . .	200	Mrs. Hall Curtis, . . .	50
Mr. and Mrs. H. P. King, . . .	200	Mrs. Robert C. Heaton, ¹ . . .	50
Mrs. John S. Curtis, . . .	150	A. C. Ratschesky, ¹ . . .	25
Philip S. Sears, . . .	150	Amos A. Lawrence, . . .	50
Miss Frances R. Morse, . . .	100		
W. B. P. Weeks, ¹ . . .	100	Total, . . .	\$14,675

Manchester.

Lester Leland, . . .	\$500	W. D. Denegre, . . .	\$250
George R. White, . . .	500	Harrison K. Caner, . . .	250
Charles E. Cotting, . . .	500	Mrs. Henrietta G. Fitz, . . .	250
George N. Black, . . .	500	H. L. Higginson, . . .	250
Mrs. R. C. Winthrop, . . .	250	Gardiner M. Lane, . . .	250
George Wigglesworth, . . .	250	Louis Cabot, . . .	250
William B. Walker, . . .	250	John L. Thorndike, . . .	250
Mrs. Henry S. Grew, . . .	250	Miss Amy Curtis, . . .	200
Edward S. Grew, . . .	250	Mrs. J. L. Bremer, . . .	200
F. M. Whitehouse, . . .	250	Walter J. Mitchell, . . .	200
Mrs. James McMillan, . . .	250	Mrs. S. Parkman Blake, ¹ . . .	200
Gordon Abbott, . . .	250	T. Jefferson Coolidge, Jr., ¹ . . .	200

¹ Available for either moth or road work.

Manchester — Concluded.

R. T. Paine, 2d,	\$150	George Putnam,	\$100
Mrs. C. P. Hemenway, . .	150	The Misses Bartlett, . .	50
Dr. R. H. Fitz,	100	Mrs. George D. Howe, . .	50
William Hooper,	100	The Misses Sturgis, . .	50
Ezra C. Fitch,	100	Richard Stone,	50
S. H. Fessenden,	100	Wm. A. Tucker,	50
Thornton K. Lothrop, . .	100	Roland C. Lincoln, . .	50
Alex. S. Porter, Jr., . .	100	Mrs. S. V. R. Crosby, . .	50
Samuel Carr,	100	Wm. L. Putnam,	50
Thomas B. Gannett, . . .	100	Nelson S. Bartlett, . . .	25
Richard H. Dana,	100	Richard J. Monks,	25
T. Jefferson Coolidge, . .	100	Russell Tyson,	25
Estate of Myron C. Wick, .	100	Mrs. James T. Fields, . .	25
Amory Eliot,	100	John H. Storer,	10
Mrs. Harriet Curtis, . .	100	Arthur M. Merriam, . .	10
T. Dennie Boardman, . .	100		
Clement S. Houghton, . .	100	Total,	\$9,170

Magnolia.

John Hays Hammond, . . .	\$500	Mrs. Wm. McMillan, . . .	\$100
Wm. H. Coolidge,	250	George F. Willett,	100
John T. Morse, Jr., . . .	250	George E. Carter,	100
Miss Elizabeth Houghton, .	250	Mrs. R. McM. Colfelt, . .	100
Miss Fannie Faulkner, . .	200	George A. Upton,	75
Oceanside Hotel,	200	James S. Lee,	50
J. Harrington Walker, . .	100	Mrs. C. H. Bull,	50
Mrs. Mary D. Turnbull, . .	100		
Wm. R. Nelson,	100	Total,	\$2,625
Edward C. Richardson, . .	100		

WORK IN THE SOUTH SHORE WOODLANDS.

The infestation of the gypsy moth for the past two years has increased considerably in the South Shore woodlands, especially in those located in the town of Cohasset. During the past season their ravages became so severe that several of the citizens, who are much interested in the woodland areas, not only in those bordering on their own property but also in others that add much to the beauty of the town, making up a committee representing the summer colony at Cohasset, took up the matter of making a co-operative arrangement with this office, and with the consent of His Excellency such an arrangement was made to take up the work under the direction of this office. The infestations being severe in several localities, the worst places were considered first, and 62 acres were thinned and brush burned, 245 acres sprayed, and 108 acres creosoted, with very fair results.

The principal reason why better results were not obtained was that not enough money was available to carry on the work to completion. It is conceded that a great amount of good was done and results were accomplished that show those interested what can be done if funds are available to carry on the work in a proper manner. In some parts of the woods there was considerable stripping, and a great deal more work should be done here, as the woodlands are appreciated by the summer residents. It is believed that in the coming year much more work will be done along this line, and probably be done in a more systematic way, so as to give protection to those who are willing to care for their own estates to a reasonable extent.

WORK ON STATE HIGHWAYS.

During the fiscal year of 1911 the work on the State highways has been supervised by this office as in previous years, and we have given it our best attention. Not only has work been done against the gypsy and brown-tail moths, but we have also worked against the elm-leaf beetle in the moth-infested section of the State. The condition of the State highways at the present time is very much improved, as far as the gypsy and brown-tail moth infestation is concerned, and is not at all serious. A general infestation of the elm-leaf beetle occurs throughout the district on the highways, and in most places is serious, and will necessitate very careful spraying during the next summer season.

The amount expended this year is somewhat increased over the previous year, owing to the fact that in 1910 the government took care of several miles of State highways which had been turned over to the care of the highway department during this year.

The necessary thinning in nearly all of the moth-infested district on the highways has been completed, and in some sections considerable spraying was done, especially in the Cape district, where the work was done in more towns in a much more thorough manner at somewhat less cost than the previous year.

There still remains much to be done in the way of removing dead wood on the State highways. This would make the work much easier during the next summer season, and a great part of it could be done during the winter. There are several dead trees which must be removed, and this work will be supervised by this office.



The power-truck sprayer in action, throwing two streams and traveling at the rate of 4 or 5 miles an hour.



Gypsy moth caterpillars dying from the wilt disease, or flacherie.

Very little of the winter work has been done as yet, owing to the fact that last year's appropriations were exhausted early in the season. The work was done at a total cost of \$7,641.44 in the following cities and towns:—

Abington.	Harvard.	Rockland.
Acton.	Harwich.	Rowley.
Amesbury.	Haverhill.	Salisbury.
Andover.	Hudson.	Scituate.
Ashby.	Kingston.	Shrewsbury.
Ashland.	Lakeville.	Somerset.
Attleborough.	Lancaster.	Southborough.
Barnstable.	Leominster.	Sterling.
Bedford.	Lincoln.	Stoneham.
Bellingham.	Littleton.	Sudbury.
Billerica.	Mansfield.	Sutton.
Boxborough.	Marion.	Swampscott.
Braintree.	Marlborough.	Swansea.
Brewster.	Marshfield.	Taunton.
Bridgewater.	Methuen.	Templeton.
Brockton.	Middleborough.	Tewksbury.
Chatham.	Millbury.	Townsend.
Chelmsford.	Milton.	Tyngsborough.
Concord.	Natick.	Wayland.
Dennis.	Needham.	West Bridgewater.
Dighton.	Newbury.	West Newbury.
Dracut.	North Andover.	Westford.
Duxbury.	North Attleborough.	Weston.
Falmouth.	Northborough.	Weymouth.
Foxborough.	Norton.	Wilmington.
Framingham.	Orleans.	Winchester.
Franklin.	Pepperell.	Woburn.
Groton.	Randolph.	Worcester.
Groveland.	Reading.	Wrentham.
Hamilton.	Rehoboth.	Yarmouth.

INFANTILE PARALYSIS.

In view of the fact that a feeling has been entertained by some people in the State that infantile paralysis has been caused in some instances by arsenate of lead used in spraying for the gypsy and brown-tail moths, the State Forester has caused a rigid investigation to be made in order to determine if there is any foundation upon which to base such fears. As a result of his research he is firmly convinced that the use of arsenate of lead has in no way been responsible for the existence of the disease, and apprehends no danger in the future from its use. His conclusions are grounded upon the following facts.

The reports for the State Board of Health for the last three years show that the largest number of cases have occurred in sections

of the State where very little spraying was done. For instance, marked epidemic centers existed in Springfield and Fall River in 1910, where no work is carried on against the gypsy and brown-tail moths, over 300 cases being reported there, while from the cities and towns along the North Shore, where very extensive operations were carried on, only 1 or 2 cases of the disease appeared during the year.

The State Forester is informed by leading physicians of the State, who have given the question very careful study, that they have been unable to discover the slightest connection between the disease and the use of insecticides.

Along the North Shore, where scores of men are employed annually during the spraying season, no injurious effects from the poison have ever been reported, although their clothing is often completely covered with the mixture. It is not an uncommon thing for them to mix the solution with their hands and arms bare. Thus it would seem that any anxiety concerning the danger from the use of arsenate of lead is entirely unwarranted.

MOTH CONDITIONS IN CITIES AND TOWNS.

The conditions of the moth work at the present in cities and towns in the infested district are given herewith so that those interested may know. These reports have been carefully prepared by men who are familiar with the same. They are arranged alphabetically, as follows:—

Abington. — The gypsy moth infestation is quite general, although no severe colonies as yet exist. The work has been carried on in a very creditable manner, and good results have been obtained. The shade trees in the town are in very good condition. Much interest has been taken in general, and the town should be handled for a considerable time on its own liability. The brown-tail moth situation is serious.

Acton. — The gypsy moth infestation is severe in this town. Considerable thinning is necessary along the roadsides, and also much spraying should be done next season. The work has been managed fairly well, and considerable interest taken by property owners. There are many orchards in the town, all more or less infested with the gypsy moth. The brown-tail moth infestation is bad.

Acushnet. — The gypsy moth occurred in this town during the past season in six places, and these colonies were sprayed, with very good results. Burlaps were also used. A few scattering caterpillars were found in this way. The brown-tail moth is generally scattered over the entire

town, and sufficient attention must be given it to prevent stripping in some of the pear orchards. The fall work has not yet begun, but the work must be carried on in a very efficient manner, in order not to show an increase in the gypsy moth infestation. We hope that the officials in charge will give it every attention necessary.

Amesbury. — The town is generally infested. The highways have been cleaned, sprayed and bush scythe work has been done where needed, and trees throughout the town are in good condition. Badly infested willows on Middle Street, Southampton Road and Exeter Road have been cut. More cutting will probably be needed next year on the wooded roads. The brown-tail moth infestation is generally light, though a bad section was found in the oak woodlands off Fern Avenue, in which the fungous disease was planted with prospects of good results. No reimbursement is needed from the State.

Andover. — This town is generally infested, severely in some localities. The residential section is in a very fair condition. Very good work was done in the past season, and good results obtained, although there are many woodland areas where the infestation is very severe, and where it must continue so, owing to the fact that the necessary funds to care for them cannot be provided by either town or State. Good interest has been shown in the work in the town, especially by some of the private property owners, and the local officials have been glad to co-operate in any way which was suggested by this office. The cost of the work in this town for the coming season will probably be less than in the past. The brown-tail moth infestation is lighter than in the past seasons.

Arlington. — The residential section of Arlington is in as good condition as regards gypsy moths as that of any town in the State. There are some wooded areas, however, which have not been cleared, owing to the fact that sufficient money could not be obtained either from the town or State. The supervision of the work is excellent, and all town officials co-operate with the State. The street trees of this town are in such good condition that it will be necessary to spray with arsenate of lead but very little the coming season, and therefore it will be necessary for the town to take some action relative to its elm-leaf beetle work, as it has done in the past.

Ashburnham. — The gypsy moth infestation in this town is generally scattered, and in the past season was very light. The work was supervised in a very thorough and efficient manner, although the town is handicapped by spread from southern towns where severe infestations occur.

Ashby. — The infestation in this town the past season was general but light, and promises to be a great deal worse this next year. The work is not supervised in a thorough manner, and it is recommended by this office that some change be made in order that the work may be conducted in a more effective and careful manner. This is very essential, owing to the fact that this town is so located as to be subject continually to infestation from the natural spread of the insects.

Ashland. — The gypsy moth infestation of this town is quite general and has increased somewhat over last year. The brown-tail moth infestation shows quite an increase. There are several orchards where gypsy moth infestations occurred where tin patching will be necessary the coming season. The past season considerable burlapping was done, and owing to the increased infestation it probably will be necessary to do more spraying and less burlapping for the year, in that way not increasing the cost of the work to any extent. A very close watch must be kept on the gypsy moth infestation, owing to the large amount of wooded areas in this town.

Athol. — The gypsy moth infestation in this town was confined to 4 colonies last season. These colonies were burlapped and carefully attended during the season by the local force. The supervision was of a very good quality, and good results have been obtained as far as can be determined. This town will be taken care of this year by the government scouts.

Attleborough. — About three-fourths of the town has been scouted, and 7 new infestations found, 1 of them being very bad. While the infestation is not really severe at the present time, a very close watch must be kept of the known colonies. They should be sprayed the coming season, and possibly some burlapping done. The work has been carried along in a creditable manner, although the local force has but very little experience in the gypsy moth work.

Auburn. — The gypsy moth infestation in this town is confined to 8 infestations, with a total of 10 egg clusters. These colonies were burlapped during the last season, and a few caterpillars were found. This fall scouting has been begun, and nothing as yet has been found, although the infestation promises to be of a serious nature, and must be watched carefully. The supervision during the past season has been of good quality, and general interest is taken by all town officials.

Avon. — The town has not been wholly scouted as yet, but so far a decrease in the number of infestations has been found. Considerable tin patching will be necessary in infested orchards, and next season spraying must be done in known colonies. The supervision of the work has been excellent, but town officials have not co-operated with this office, and the work has been hampered, owing to the necessary funds not being available.

Ayer. — The infestation of the gypsy moth is general and severe in some localities. The brown-tail moth infestation is very bad. The work has not been carried on in an efficient manner, and everything has been done to hinder it by local officials. During the past season the necessary funds were not available for the work, and necessarily the town was not gone over thoroughly. The supervision has been poor; there is much need of better supervision, and the work should be done in a much more efficient manner.

Barnstable. — The gypsy moth infestation is general. There was but 1 serious colony discovered last season. A considerable amount of work

was necessary to suppress this colony, and the results of this work should be permanently felt. The brown-tail moth infestation was most serious and expensive to the town the past season. The supervision has been of very high quality, and good general interest has been shown by the town officials and property owners where colonies have been located.

Barre. — The gypsy moth infestation in this town was confined to 3 egg clusters last season. All colonies were burlapped and carefully attended during the season, no caterpillars being found. The scouting this year will be carried on by the government forces. Supervision was very careful.

Bedford. — The residential sections in this town, the orchards in the village and the street trees, are in excellent condition. The woodlands, as in most towns, have not been cared for in the main, and show some bad infestations. Considerable protective work here may be necessary for some years to come to give relief to the neighboring estates. The supervision of the work is efficient, and the expenditure economical. In some parts of the town spraying will be necessary only for the elm-leaf beetle and therefore the town should make provision for this. The brown-tail moth infestation is general.

Bellingham. — The infestation of this town by the gypsy moth occurs in but few places. However, 1 colony occurring on a large white oak shows 200 egg clusters. Very thorough work was done the past season, and at the present time where infestations were known very little is to be found. This town does not require State aid, and if the work is carried on in a proper manner, it will not need it for some years to come.

Belmont. — The gypsy moth infestation in this town was very severe several years ago, but by continued effort the infestation to-day, especially in the residential section, is very light, although it is necessary to look over the private estates each year. The interest shown by the officials of this town has been exceptionally good. The work has been supervised also in a most excellent manner, and though there are a few orchards yet which need treatment, such as thinning, burlapping and removing of old trees, on the whole the town is in very good condition.

Berkley. — Only 2 infestations of the gypsy moth were found up to this fall, and these were carefully burlapped and attended during the caterpillar season, and no caterpillars found. In this fall scout 1 gypsy moth egg cluster has been found. Very careful work should be done, and every possible means taken against the gypsy moth infestation, owing to the fact that, as a greater part of the town is wooded area, if the gypsy moth is allowed to spread to any extent, the expense will be great in future years. The brown-tail moth infestation is general but light.

Berlin. — The gypsy moth infestation in this town is general and severe in some places. The work in the past season consisted of creosoting egg clusters in the winter and burlapping in the summer, with very good results. The supervision of the work has been very good, but the infestation has increased to such an extent that more thorough work will be needed

the coming season, and better methods must be adopted. There is considerable orchard and roadside work to be done, and roadside thinning where infestation exists. The brown-tail moth infestation is very bad.

Beverly. — The gypsy moth infestation is general. In some parts of the town, especially on street trees, some severe infestations occur. The work in general has been carried on in a very fair manner, although it is evident that the supervision is not close enough. Much more thorough work should be done in the residential section on private property, so that the care of these estates will be much easier in the future. The outside territory has been somewhat neglected in the past two years, and it may be necessary to expend a somewhat larger amount for the coming season. The woodland areas have been taken care of through the North Shore fund to some extent. General interest by property owners owning large estates has been shown.

Billerica. — The gypsy moth infestation is general in this town, though it is severe in some localities. Considerable improvement is shown in the residential section over last year. The work has been done in a very thorough and efficient manner, and the local officials have been ready to help as far as possible. Owing to the fact that considerable work has been turned over to the town which was previously taken care of by the government, the cost next year may be increased over last year. The brown-tail moth infestation is only about one-half as bad as last year.

Blackstone. — There were 2 infestations of the gypsy moth found in this town last year. These were both cleaned. The town should be thoroughly scouted this winter, and it will probably be done by the town. There are a few brown-tail moth webs in the town.

Bolton. — The gypsy moth infestation in this town is general and severe in some places. The work during the past season consisted of creosoting egg clusters in the winter and burlapping in the summer season, with very good results. The supervision of the work has been very good, but the infestation has increased to such an extent that more thorough work will be needed the coming season, and better methods must be adopted. There is considerable orchard and roadside work to be done, and roadside thinning where infestation exists. The brown-tail moth infestation is bad.

Boston. — The city of Boston is a great gypsy moth problem in itself, covering, as it does, such a large area. With between 800 and 900 miles of streets, the expense of treating the gypsy and brown-tail moth infestations is very large, and there has not been a year yet in which sufficient funds have been available to cover the entire city in a proper manner. But it is hoped that this may be accomplished the coming season. The State has been very liberal in the past two years with its reimbursement to the city, and the city officials in charge of the work have shown an excellent spirit, and have done good work as far as their funds would permit; but in the past season there were several of the districts, especially Brighton, which were in serious condition, and caused considerable annoyance to the property owners. However, the city at this time is provided with better spraying apparatus, and we hope the number will be increased

by another season. We have every reason to believe that the entire city may be covered, both in treating the gypsy moth egg clusters, removing the brown-tail moth webs and spraying the trees. The cost of the work in Boston, to put the city in good condition, might well be \$100,000 annually for the next two or three years.

Bourne. — The gypsy moth has occurred in this town in several places, and work has been done in a very thorough manner in all colonies. At one time the town received assistance from the State, but for the past two years it has not been necessary for it to have reimbursement. The town is now being scouted, and nothing serious has as yet been found, although several small colonies have been located. The work in the past has been done for less than half the town's liability, which is very creditable to those in charge. The brown-tail moth is prevalent.

Boxborough. — The gypsy moth infestation is severe in this town. Considerable thinning is necessary along the roadsides, and also much spraying will be needed for the next season. The work has been managed in a fairly good manner, and considerable interest taken by property owners in this town. The town has also many orchards, all being more or less infested with the gypsy moth. The brown-tail moth infestation is bad.

Boxford. — The town is generally infested by the gypsy moth. Nearly all highway trees have been kept in fair or good condition with the exception of the Lake Shore, Bradford and Groveland roads. Spraying, cleaning and bush scythe work have been done on all traveled roads. At the present writing the Lake Shore and Bradford roads are being cut out. As the government has taken up the care of nearly all the traveled wooded roads, the help from the State for next year can be greatly reduced. Private property with few exceptions is self-supporting. The brown-tail moth infestation is very light.

Boylston. — The infestation in this town is confined to twenty-seven estates, with a total of 270 egg clusters. While these infestations were found by local forces, it is very evident that the scouting was not as careful as might have been, as many caterpillars were found during the past season. Probably the inexperience of the local men accounted for the fact that so many egg clusters were skipped. While they tried to do good work, the results of turning the burlaps showed a large number of caterpillars.

Braintree. — The gypsy and brown-tail moth infestation of this town is general but not severe as yet in many places. The work for some years past has been handled in a very inefficient manner, and suggestions from this office have not been carried out, but during the past season the work has been undertaken by a man thoroughly acquainted with the problem, and the town has been cared for as far as funds would permit. It is hoped that in the coming season the superintendent in charge of the work may have the necessary funds to cover the town in a more thorough manner, as the infestation at this time is in such a condition that it can be watched very easily with a reasonable amount of money.

Brewster. — There are no gypsy moths here so far as known, but the brown-tail moth is prevalent. The work is being carried on in a very efficient manner.

Bridgewater. — The gypsy moth infestation of this town, as far as scouting has been done this year, is found to be worse than the past season, the moths having been found scattered all over the town. Brown-tail moth conditions are also worse. For the coming year it will be necessary to do considerable tin patching in infested orchards. The work has not been carried on in a manner satisfactory to this office in the past. The private property charges returned were somewhat smaller than they should have been, owing to the fact that they were not made in a careful manner. The best interest is not shown by the local officials in the work, and there must be a closer co-operation with this office in the future. The charges to property owners should also be looked after much more carefully.

Brockton. — The condition of this city in regard to gypsy moth infestation is very bad. The chief point to be insisted on, to insure the prosecuting of the work in a thorough manner, is the appropriation of sufficient funds by the city government. There is much work necessary. The supervision for the past season has been good, and if the necessary funds are available for next year's work excellent results can be obtained; but if not enough money is expended in the coming season's work, a considerable increase of the gypsy moth will be shown. This city is very badly in need of a large power sprayer to do the gypsy and brown-tail moth spraying.

Brookfield. — As far as known, there is no gypsy moth infestation in this town. The brown-tail moth is generally scattered over the town.

Brookline. — The gypsy moth infestation in this town for some years past has been one of a very serious nature. Until within two years ago the work was not managed properly, and was done in a very half-hearted manner. Since that time, especially for the past two years, excellent work has been done, the entire town being covered with the necessary methods, such as treating the gypsy moth egg clusters, removing brown-tail webs, carrying on spraying operations on a very large scale, etc. This town, being one of considerable wealth, has expended very large sums of money, and has not, as yet, applied to the State for financial aid. The interest taken in the work here by those in charge is very gratifying, as every possible means known to them are taken to suppress the pest, and at the present time the town may be considered to be in excellent condition, with the exception of the woodland, where the work will be undertaken with the same earnest efforts that have been directed against the pests in the residential section.

Burlington. — The situation is serious here, owing to the fact that the town consists mostly of woodland, of which only a small part has been cleared. The woodland work has been almost entirely confined to roadsides and protective belts around orchards. Good work has been done here, but the severe infestations in the surrounding woods make reinfesta-

tion almost certain. The supervision of the work has been good, much interest has been taken by the townspeople, and good results from the amount of money available have been obtained.

Cambridge. — While the gypsy moth infestation of this city is general, it is not known to be severe in any part. Although Cambridge has suffered the loss of a great many street trees, it cannot be laid to the gypsy and brown-tail moths. Several years ago the infestation promised to be very serious, but through the continued efforts of the local officers it has been brought to a very good condition. The work is carried on in a very careful and thorough manner, and general interest is taken.

Canton. — The gypsy moth infestation is quite general in this town, but a slight improvement is shown over last year. There are many orchards which need caring for and several woodland colonies which should be cleaned, that is, those bordering on the residential section. The supervision of the work has been very good, and considerable interest is shown by town officials and private property owners where colonies occur. The town needs a power spraying equipment.

Carlisle. — The gypsy moth occurs in all parts of this town, and as it is almost entirely comprised of woodland, the problem is very serious and very difficult to handle. The work has been confined mostly to wooded roadsides and residential sections. Good results have been accomplished as far as possible under the existing conditions, and the supervision has been of good quality.

There has been some work done also in what is known as "Carlisle Pines," under the direction of the town, and it is the intention of this office to continue doing a small part of the work there each year, to try to preserve these beautiful pines if possible. The brown-tail moth infestation is general.

Carver. — The gypsy moth is generally scattered throughout the town, but is not a serious problem as yet. Considerable work will be necessary for the coming year in the orchards. Bad colonies in this town have been cared for, and have not grown to any large proportions. The supervision has been of an excellent quality, and good interest shown by the town officials. The brown-tail moth infestation is very light.

Charlton. — The gypsy moth infestation in this town is confined to 1 colony, which promises to be quite serious, between 400 and 500 egg clusters being found. All the necessary work was done in a very careful manner the past season, and during the burlap season many caterpillars were found. It will be necessary to watch these colonies very closely the coming season to prevent the town from becoming generally infested. Work was supervised in a very careful manner, and general interest is taken in the work. The town will be cared for this year by the government scouts.

Chatham. — There is no gypsy moth infestation here as yet. The brown-tail moth is very scarce. All necessary work being carried on in a very practical way.

Chelmsford. — The gypsy moth infestation is severe all over this town. The residential sections being very small and the greater part of the town wooded area, it is very hard to make a gain against the gypsy moth. Very efficient work has been done as far as possible, and local officials have co-operated well with this office. The greater part of the private property in the residential sections is self-supporting. The government has assisted very materially in this town, but there are a great many streets now bordering on wooded areas which the town has not been obliged to spray in the past that will have to be cared for and sprayed by the town the coming season. The brown-tail moth infestation is considerably less this season.

Chelsea. — The gypsy moth infestation of this city is very light. The city being entirely residential, the moth situation is very easily handled. Good interest is taken in the work, and it is also supervised in a very excellent manner.

Clinton. — The gypsy moth infestation is general, and severe in some localities. The moth work has been taken up the past season in a very thorough manner, and considerable improvement made in the condition of the town; good interest has been shown by all. The brown-tail moth infestation is general.

Cohasset. — The gypsy moth infestation of this town is one of a serious nature, both in the residential and wooded areas, for although the residential work has been carried on for the past four or five years in a very good manner, it is greatly handicapped by the surrounding woodlands, where serious infestations occur at the present time. In the orchards of the town there is considerable tin patching necessary, and removing of dead trees; in the wooded section last season, where this work was done with fairly good results, there was a special fund provided. In the coming season it is expected that a very much larger sum will be forthcoming, and such woodland work will be done as is necessary to protect the residential section, especially along Jerusalem Road, and the wooded roadsides in the Turkey Hill district. Excellent co-operation has been given by the local officials and by those in charge of the South Shore fund. The spirit in general shown by the people has been good, and they are deeply interested in the work and willing to co-operate in every possible manner.

Concord. — The gypsy moth infestation of this town has been very serious, and is, at the present time, in the wooded areas. The residential section now is in good condition, and the work has been managed in a most efficient manner. The interest shown by the local officials has been great, and it is hoped that the large woodland property owners may be willing to co-operate in the work in the coming season. Every possible means which might be adopted to suppress the moths have been used along economic lines. The people of the town have taken interest in the work.

Danvers. — The gypsy moth conditions are somewhat better than last

year. The residential section in general shows an improved condition. There still remains considerable tin patching to be done on private property. Wooded areas are very severely infested. The supervision has been efficient, and good results have been obtained. The spirit shown by the local officials is good.

Dedham. — The condition of this town in regard to the gypsy moth infestation is very bad, owing to the fact that not a sufficient amount of work has been done in the past. The supervision has been very poor, and but little interest has been shown by the local officials in charge until recently, when a change was made in the officials, and we believe these new officers will prove to be much more efficient. Considerable spraying will be necessary for the coming season, and the town should purchase a large power outfit, and have the work done in a more thorough manner than in the past. This town can easily be self-supporting if the work is managed properly, but if conditions are allowed to continue as they have been in the past season, serious infestations will occur in the coming year which will necessarily be very expensive to handle.

Dennis. — No gypsy moth occurred in this town so far as known. The brown-tail moth is quite plentiful. Work has been done very carefully and thoroughly. Good interest is shown by the town officials.

Dighton. — The fall scout has not yet been made in this town. The brown-tail moths are generally scattered throughout the town, and more interest must be taken by the town officials both in the brown-tail and gypsy moth work than has been previously. They must acquaint themselves with the best methods, and follow instructions more closely, as more thorough work must be done.

Douglas. — This town was found to be infested two years ago, but the infestation consisted of 1 female pupa case. No signs of the gypsy moth have been found since.

Dover. — This town has shown a great improvement in the past year. There were many woodland colonies which received treatment, and much improvement was thus made. There were very few burlaps and little tanglefoot used, and spraying was done in all places possible. The private property is only about half self-supporting, but it is our opinion that all work is charged for as far as possible. This town should have help from the State for the coming year. All woodland colonies will be cleaned where owners will bear the expense, and where they will not, a protective belt will be established. There is also a great deal of tin patching necessary. The town has a Church power sprayer.

Dracut. — The gypsy moth is found scattered over this town, but the infestation is very severe in some sections. The residential sections and street trees show the results of good care. The supervision has been of a very excellent quality, and good feeling is shown by the town officials. The work can probably be handled the coming season for less money than in the past. The brown-tail moth infestation is considerably less this year.

Dudley. — This town was discovered to be infested two years ago by the government scouts, only 3 pupa cases being found. Nothing has been found here since.

Dunstable. — The infestation of this town by the gypsy moth is general, and it is becoming quite severe in some places. The work has been managed in a very efficient manner the past year, and good results obtained, especially in the residential section. There are some woodland infestations which will need attention the coming season, the worst of them being in the part of the town near East Groton, and along the Nashua & Tyngsborough railroad line. The town officials have been ready to co-operate with this office, but more spraying apparatus should be available in this town for the coming season.

Duxbury. — The gypsy moth infestation is scattered over the entire town, although no very serious colonies as yet are known. This fall's scout in the residential section has shown no noticeable increase, and the greater part of the infestation can be handled by creosoting alone; there are a very large number of estates on a self-supporting basis. Several woodland colonies are being handled by the town where practically creosoting alone will care for them in a very satisfactory manner. Supervision of the work has been very good and general interest taken by the townspeople.

East Bridgewater. — The infestation in this town is found to be more scattered than last year, but by doing away with burlap and spraying all places possible, the cost of the work for the coming year will not be increased. The work on private property will be covered by about one-half the cost of the work. There will be some tin patching necessary for the coming year, but by changing methods from burlapping to spraying, this town should be able to do the necessary work this next year without any allotment from the State. The town used burlap on all infestations the past year. They have a hand-spraying outfit.

Eastham. — No gypsy moth infestation as yet has been found here. The brown-tail moth is quite plentiful. Work is being done in a very efficient manner.

Easton. — The scouting of this town has been nearly finished and a large increase in number of infestations found that will require a great amount of zinc patching. This town has in the past used burlap on all of the infestations, but we have recommended the use of spray in next season's work, and in order to do necessary spraying they should have a large power sprayer. They have a hand outfit here at present. The liability of the town is sufficient to do necessary work.

Essex. — The gypsy moth occurs generally in this town, but the residential section, only a small part of the town, is in somewhat better condition than last year. Considerable more tin patching and removing of dead trees in orchards is still to be done. The wooded areas are not severely infested, and some of them have been cared for from the North Shore fund. The supervision has been good, and local officials have shown an excellent interest.

Everett. — The gypsy moth infestation in this city is general, but only in a few localities can it be considered of a serious nature. It is very easily handled with a small number of men, as the entire city is residential, and there are no wooded areas to give trouble. Conditions therefore are excellent, and no damage need occur if work is continued along the same lines and with the good supervision of the past. The brown-tail moth occurs generally.

Fairhaven. — The fall scouting is being conducted at the present time through the town for the gypsy moth, three new infestations having been found at the present time. The brown-tail moth infestation is general, and quite heavy in the village, so much so in some sections that stripping will occur if webs are not removed. However, we are assured that this will be done all over the town, and feel fairly sure that work will be conducted in a thorough manner, so as to prevent further spread.

Falmouth. — The gypsy moth infestation of this town this year promises to be somewhat lighter than in the past season. There are a few brown-tail webs noticeable. In the vicinity of old colonies, two small new colonies have been located by the State inspector. The general interest in the work here has not been good, and possibly those in charge of the work do not realize the danger of not providing for work on a larger scale. It would be very helpful in handling the moth situation, as well as the elm-leaf beetle, if the town could be provided with a power sprayer.

Fitchburg. — The city is generally infested with the gypsy moth, although the infestation was not very severe in the past. The work this year so far has shown conditions to be much worse than heretofore. The work in the past season was very poorly managed, but at the present time it is under new management, and it is hoped that much better results may be obtained the coming season.

Foxborough. — The gypsy moth occurs in but few localities in this town, and the results of last year's work have been found to be very good, although the town has not been fully scouted at this time. The supervision has been of good quality, and considerable interest taken in the work as a whole.

Framingham. — The gypsy moth infestation of this town is quite severe, although in the residential sections it has been held in check very well. The woodland is continually getting worse, and considerable more spraying will be necessary for the coming season. The supervision has been of a very good quality, but owing to the use of the burlap methods not as large a gain has been made against the moth as if more spraying had been done. It would be a very good policy for the town to buy a large power sprayer for the coming season. The interest taken in the work in general has been very good, and co-operation of the officials has been excellent. The full liability of this town should be made available at an early date, so that the necessary work can be carried on without hindrance from lack of funds. The brown-tail moth infestation of this town is very severe, owing to the fact that the whole area was not covered in brown-tail moth work last year.

Franklin. — The gypsy moth infestation in this town is scattering. The town is being scouted at the present time, and more infestations are being found than last year. The interest shown in the work by the local officials has not been of the best. For the coming season more interest must be taken in the work, and closer co-operation with this office will be necessary. More thorough work should be done in the way of tin patching and removing the dead trees in orchards where infestations occur.

Gardner. — Although the scouting done a year ago only discovered 124 egg clusters, this fall's scout has shown about 900 egg clusters, generally scattered all over the town. It is very evident that this town is being re-infested by the natural spread, for we believe that the work has been done very carefully and conscientiously by the local forces. In fact, the general interest in the work in the town is excellent.

Georgetown. — The town is generally infested. The highways are generally in good condition where thinning operations have been carried on. Nelson Street, which has been cut out this fall, was quite badly infested. Cleaning, spraying and bush scythe work have been done where needed. The work done by the government has greatly reduced expenses, and the town should get along next year with less help from the State. Private property, with a few exceptions, should pay for itself. The brown-tail moth infestation is light.

Gloucester. — The infestation is scattering, but very severe in some parts, especially in the wooded areas, although considerable of the woodland in the West Gloucester district was cared for from the North Shore fund. The residential section and street trees are in very good condition. Work has been managed well and carried along on economic lines. Officials in general have shown a willingness to co-operate with the State in the work.

Grafton. — The gypsy moth infestation in this town last season was confined to a few colonies, but so far this year's scout has developed about twice as many infestations, although the town is only half finished at the present time. General conditions in regard to gypsy moth infestation promise to be quite severe, and thorough work must be done in the coming season. While the supervision of the work was of a good quality, it is very evident that much more care must be taken to prevent a general scattering infestation throughout the town.

Great Barrington. — As the gypsy moth was discovered in Lenox and Stockbridge this fall, it was thought necessary by the United States Department of Agriculture that a thorough scouting be given the towns surrounding the infested ones, and during this scouting this town was found to be infested in one locality. The infestation promises to be quite serious, and hard to clean up in a proper manner. It is located in the section where many old buildings and old trees occur, and very thorough and conscientious work will be necessary to stamp out this colony. The local officials have taken an extremely good interest in the work, and we believe that everything will be done that can be done to wipe out the

pest. They have also arranged with this office to have experienced men do the work at the town's expense.

Greenfield. — The infestation which was found here in 1907 and 1908 apparently has been stamped out. The brown-tail moth occurs in this town.

Groton. — The gypsy moth infestation in this town promises to be very serious the coming season unless a large amount of work is done. In the past, the co-operation and interest on the part of the town officials have been lacking, therefore the gypsy moth has increased in numbers to a very large extent. The town should be thoroughly gone over this winter in the way of cleaning, treating the gypsy moth egg clusters, and removing brown-tail webs, both on street trees and private property, and then this work should be followed up by spraying with arsenate of lead in the early summer. It is hoped that the officials in charge of the moth work, and those in charge of funds, will appreciate the importance of the problem now, and see that such funds as may be necessary are forthcoming for the year 1912. If the town will do its part, the State will gladly co-operate in this work. A power sprayer should be available for next season's work.

Groveland. — The town is generally infested. All highway trees were cleaned and sprayed, and are generally in good condition. Badly infested willows on Washington Street and Uptack Road near the pond have been thinned out, and bush scythe work done where needed. Roadside cutting will be needed next year on Seven Star and Bear Hill roads. Private property, with few exceptions, will pay for itself. A small amount of help from the State will be sufficient, about the same as in 1911. The brown-tail moth infestation is light.

Halifax. — The infestation by the gypsy moth is general throughout the town, although the residential section is only scatteringly infested, there being nothing serious. In these sections but very little work will be necessary this year. The woodlands, however, are generally infested, and much hard work will be necessary to prevent a bad outbreak the coming season. There is much pine woodland in this section, and the scouting of the woodland seems to be necessary while the infestations continue to be of a slight nature.

Hamilton. — The infestation of the gypsy moth at the present time is mostly in the woodland, the residential section being in a very fair condition, although there is considerable tin patching and removing of dead trees in some of the orchards to be done. The work has been supervised in a very good manner, and generally good results obtained. The co-operation of local officials has been good.

Hanover. — The infestation is quite general throughout the town, although conditions are considerably better this year than in the past. This is due mostly to the careful creosoting and work in the orchards, particularly in the creosoting of old dead trees. There remain, however, many more orchards to be cared for. The work has been very carefully

managed and done in a thorough manner. There are some small known infestations in the woods which have been cared for in the past. The careful work must be continued in order to bring a greater part of the residential property to a self-supporting basis. Very good interest is shown by the local officials.

Hanson. — The gypsy moth infestation in the residential section is about the same as last year. No bad colonies as yet exist. The town contains many orchards, which necessitate a large amount of orchard work, such as tin patching and removing of dead trees. The street trees are in very good condition. The supervision of the work has been very good, and a general interest has been shown. The woodland infestations are being cared for at a very small expense, and no increase shown over last year as far as the scout has been carried this fall. In the worst colonies which we had in the woods last year the moths have been greatly reduced in number.

Harvard. — The gypsy moth infestation of this town is general, and severe in some places. The work in the past season consisted of creosoting egg clusters in the winter and burlapping in the summer, with very fair results. Supervision was of a good quality, but the infestation has increased to such an extent that more thorough work will be needed the coming season, and better methods must be adopted. There is considerable orchard and roadside work to be done, and roadside thinning where infestations exist. The brown-tail moth infestation is bad.

Harwich. — This town is not yet infested with the gypsy moth, and has but few brown-tail moths. All necessary work is being done.

Haverhill. — The gypsy moth infestation of this city is general, and quite severe in some localities. The work has been handicapped to some extent, owing to the fact that sufficient funds have not been available to do such work as should have been done. There are a number of places in the outlying districts of the city that were not cared for this past year where thinning and spraying should be done next year. This office has tried to impress upon the local officials the necessity of the city having a power sprayer, but has not as yet succeeded. Considerable contract spraying has been done in the city, but with the amount of money that this work has cost a good power outfit might be owned by the city at the present time, and the same amount of spraying done. The conditions on private property are a little better than last year, although the gain against the moths was not what it should have been. More funds should be available, and more thorough work done on private estates throughout the city. The brown-tail moth situation generally throughout the city is somewhat better than last year.

Hingham. — The gypsy moth infestation of this town is very severe, especially in the woodlands, and the residential section is not in as good condition as it should be for the length of time the work has been carried on. Considerable tin patching and cementing has been done in the past, and the same work must be done in the future, but owing to inefficiency

on the part of the local men the town was allowed to become quite seriously infested throughout the residential section. At the present time the work is being carried on in a very efficient manner, and it is hoped that in the coming season better results will be accomplished, and that conditions may be much better from a gypsy-moth standpoint next year.

Holbrook. — While the infestation of this town is quite general, although very light, not much gain has been made against the moth, if any, and conditions are somewhat worse than the past year. The supervision has not been done in a thorough manner, and there is no co-operation with this office. For the coming season there should be better supervision of the work; if not, the gypsy moth infestation promises to be very severe.

Holden. — The gypsy moth infestation in this town was confined to ten estates last year, with a total of about 5 egg clusters, but this year's scout has shown about sixty places infested with about 400 egg clusters. The town, we believe, is being infested by the natural spread from other places, as the work was supervised in a thorough manner, and good interest shown in the work by the townspeople.

Holliston. — The gypsy moth infestation of this town is quite general, and has been found this year to be somewhat worse than last year. Considerable patching and removing of dead trees will be necessary in the orchards where the colonies exist, and the use of arsenate of lead in spraying instead of burlap for the next season we feel will prove to be more effective. The supervision has been very fair and considerable interest has been taken in the work.

Hopedale. — The gypsy moth occurred in but few places in this town, and the work has been supervised in a very excellent manner. Everything has been done that was necessary to combat the gypsy moth in the best manner.

Hopkinton. — The gypsy moth infestation of this town is not severe all over the town, but is quite serious in some localities. There was no work done the past year, owing to the fact that no appropriations were made in the town, and naturally the conditions are somewhat worse than last year. The interest shown by the people in general has not been good, although if the appropriations had been available we feel that good results could have been obtained. The local superintendent was very willing to co-operate with this office, and funds should be made available at an early date, the full liability being necessary to continue the work against the moths for the coming season.

Hubbardston. — The gypsy moth infestation in this town was confined to 1 egg cluster the past season, and the locality was burlapped and carefully attended, and no caterpillars were found. The work will be done this year by the government scouts.

Hudson. — The gypsy moth infestation in this town is much less than last season. Much tinning work of a good permanent nature has been done in the orchards, but there is much more still to be done. Work has been managed in a very efficient and thorough manner, and good interest

shown by the local officials. The brown-tail moth infestation is severe in some localities, though not really bad.

Hull. — The infestation of the gypsy moth in this town is general, but not severe. The work has been carried along in a very careful manner, and very good interest shown. Hardly any woodland occurs in this town, and it is a very easy matter to handle the gypsy moth problem.

Hyde Park. — The gypsy moth infestation of this town was very severe last season. The work has been considerably handicapped by the fact that the proper amount of funds has not been available for the work. Many of the local officials have attempted to interest themselves in the work, but as they were inexperienced, and did not have a thorough knowledge of methods of work, not much improvement has been made. The appropriations which were asked for in town meeting were cut so much that the proper amount of work could not be done. During the past season considerable work was done in the residential section, which is becoming very badly infested, and so far this year very good results have been obtained, but the infestation is one of a very serious nature, and must be taken up along more careful and efficient lines. Next season this town will be a part of the city of Boston, and the work will not be handicapped further by the mismanagement of those who are ignorant of the first principles of efficient moth suppression.

Ipswich. — The town is generally infested. Cleaning and spraying have put all the traveled roads in excellent condition. Considerable bush scythe work and cutting have been done this fall, which, taken with the work done by the government, should greatly reduce the amount of help needed from the State the coming year. The brown-tail moth infestation is light, though in some sections the oaks and pear trees seem to be well covered with nests.

Kingston. — The gypsy moth infestation of this town is very general. The residential section is in very good condition. The greater part of the orchards have been cared for, and put in a condition where moth work can be efficiently done and a greater part of the expense charged to the property owners. The woodland colonies in this town have been cared for in the past season, and excellent results obtained. The summer before last considerable spraying was done in the woodland, with such good results that in the past season only creosoting was necessary. It is believed that these woodland colonies can also be handled this season by creosoting alone. The interest taken by individuals in the town is very good, and has been helpful to this office.

Lakeville. — The gypsy moth was discovered in this town in 1905. There was no further evidence of its presence until this fall, when a colony consisting of 8 egg clusters on apple trees, was found at King Philip's Tavern. This was found by one of the representatives of this office. The town force has not yet begun the fall scout, but there is every reason to believe that another infestation will be found. The officials in charge of the work should qualify themselves to do efficient work, and take advice

from those who are trained. The brown-tail moths are very numerous in orchards, and we feel that it is due to lack of interest and efficiency, as a great many places were not covered thoroughly last spring, and as a result the infestation is much more severe this fall. More interest must be taken, and better work done by the local officials.

Lancaster. — The gypsy moth infestation is general, and severe in some localities. The moth work has been taken up the past season in a very thorough manner, and considerable improvement made in the condition of the town; good interest has been shown by all. The brown-tail moth infestation is general.

Lawrence. — The gypsy moth infestation of this city is very general, and severe in some localities. The work for the past season has been efficient and done in a creditable manner, much more work being done the past year than any year since this city became infested with the gypsy moth. A very thorough campaign was made on private property throughout the city, with excellent results. With the exception of some localities, where corporations were allowed to do their own work, the city is in much better condition than the past season. The brown-tail moth infestation is also considerably less than in the past season. More funds should be available for the coming year. Private property work should be done to a greater extent still, and then in the future nearly all of the private property in the city will be on a self-supporting basis.

Leicester. — The gypsy moth infestation in this town in 1908 was slight, only a few caterpillars being found; nothing was seen from that time until this fall's scout, when 10 egg clusters were found on one estate. The town is being watched very carefully, and a good attempt is being made to prevent a general scattering infestation.

Lenox. — The gypsy moth was found in this town the past season some time in the early part of August, and immediately a representative was sent from this office to determine the extent of the infestation. Later the town provided sufficient funds, experienced men from this department were employed, and the town was scouted, with the result that about 300 gypsy moth egg clusters were found, nearly all located in one section; also, several single nest infestations have been located in other sections of the town. Good interest has been shown by property owners and town officials, and it is believed that everything will be done to stamp out the gypsy moth if possible.

Leominster. — The gypsy moth infestation is general, and severe in some localities. The moth work has been taken up the past season in a very thorough manner, and considerable improvement made in the condition of the town, good interest being shown by all. The brown-tail moth infestation is general.

Lexington. — The condition of this town in regard to the gypsy moth infestation is considerably improved over past years in the residential section. The woodland infestation is still of a very serious and troublesome nature, as its tendencies are to reinfest some properties where good

thorough work has been done. The work in general has been carried on in a very careful and efficient manner, and much interest has been taken by public-spirited men in the town, as they have realized the importance and necessity of handling the work in an economical manner. A large amount of credit is due the officials in charge of the work for the stand which they have taken relative to the elm-leaf beetle work. The town has made liberal appropriation for the care of the same, in that way relieving the gypsy moth work to some extent. Considerable interest has been taken also by owners of large estates, who have paid the full cost of the work on their property. With one or two exceptions the town has the co-operation of the property owners. The brown-tail moth infestation is general.

Lincoln. — The gypsy moth infestation of this town is very serious, especially in the wooded areas. The residential section is in a very good condition but this comprises but a small part of the town. There are several woodland owners in the town who are showing excellent co-operative spirit, and have spent large sums of money on their property. The supervision of the work is of an excellent quality, and good results were obtained here in the past season.

Littleton. — The gypsy moth infestation is severe in this town. Considerable thinning is necessary along the roadsides, and spraying will be necessary the next season. The work has been managed in a fairly good manner, and considerable interest taken by property owners in the town. This town has also many orchards, all being more or less infested with the gypsy moth. The brown-tail moth infestation is bad.

Lowell. — The gypsy moth infestation is general and severe throughout the city. There has not been any work done in this city since the middle of May, 1911, as the city government did not make provision for the suppression of the moths. This matter was taken up with His Excellency the Governor, but he did not wish to take any action in the matter in regard to carrying out that section of the law which allows this office to take up the work in a town or city when it refuses to make provision for the work. When the winter work was in operation, the supervision was not thorough, and the work was of a very poor quality. It will be necessary in the coming season to have a considerably larger sum of money appropriated by the city, and the work should be supervised by some one with a thorough knowledge of the work in general. If the work is not taken up at the proper time the coming season, the gypsy moth infestation of this city promises to be as bad as any in the metropolitan district. The brown-tail moth infestation is somewhat less than last year.

Lunenburg. — The gypsy moth is generally scattered throughout the town, and the infestation is becoming very serious in some localities. The work was very well supervised in the past season, although conditions promise to be worse for the coming season. This town is so located as to be subject to natural spread from severe infestations south of it, and

drastic measures must be taken in order to bring about good conditions in the residential section.

Lynn. — The gypsy moth infestation of this city is very general, and though not very serious in the residential section, it is extremely so in the wooded areas, especially in that part known as the Lynn Woods Reservation. This city has been greatly handicapped in the past season by not appropriating a sufficient amount of money to carry on the necessary work in the residential section alone, and especially the last season. As the cleaning operations were carried on throughout the city, both on street trees and on estates in the residential sections, no money was available to do spraying to any extent, thus much worse conditions exist this year than should be expected. The Lynn Woods problem is one of a very serious nature, and it has been very difficult for this office to obtain the necessary co-operation from the city in order to make any start or gain against the moth in this section. Considerable work has been done, but not what might be termed of a permanent nature.

Lynnfield. — In this town the same conditions prevail that we find in many small country towns. Small residential sections are surrounded by wooded areas, which reinfest the orchards, roadsides and gardens after they are thoroughly cleared once. In spite of all efforts this reinfestation will occur until the woodland has been thoroughly cleaned. The supervision in the town has been good, and the town officials have willingly co-operated with this office. The brown-tail moth infestation is general.

Malden. — A few years ago the infestation of this city by the gypsy moth was very serious, but at the present time it occurs only in a very general way throughout the residential section. Some of the wooded areas, principally those bordering on the Medford line, near the Malden hospital, and those near the poor farm, are quite seriously infested still, although the work in general has been handled very well, and the moths have been kept from increasing in the residential section. More work might have been done if more spraying apparatus had been available, and it would be in the city's interest to purchase one or two power sprayers the coming season for both gypsy and brown-tail moth work. This would also assist them materially in their elm-leaf beetle work. It is very gratifying to note that for several years the city has not received reimbursement from the State, the situation being handled entirely from the city funds. The brown-tail moth infestation is general.

Manchester. — The infestation is general and very severe in some parts. Some of the wooded areas are being taken care of from the North Shore fund, and the residential section, street trees and private property are in much better condition than last year. Supervision has been very good, and an excellent spirit in general has been shown in the work.

Mansfield. — The gypsy moth infestation of this town is quite general, much worse than last year. The work has been managed in a very poor manner, and the proper interest has not been taken in suppressing the

moths. The use of burlap has been the principal method used against the caterpillars after the winter work was done, and the necessary patching of holes and removing of dead trees have not been done. This work should be done the coming season. The town should provide itself with a power sprayer, and adopt the use of arsenate of lead in spraying instead of using burlap, and should see that the supervision is of a much better quality for the coming season.

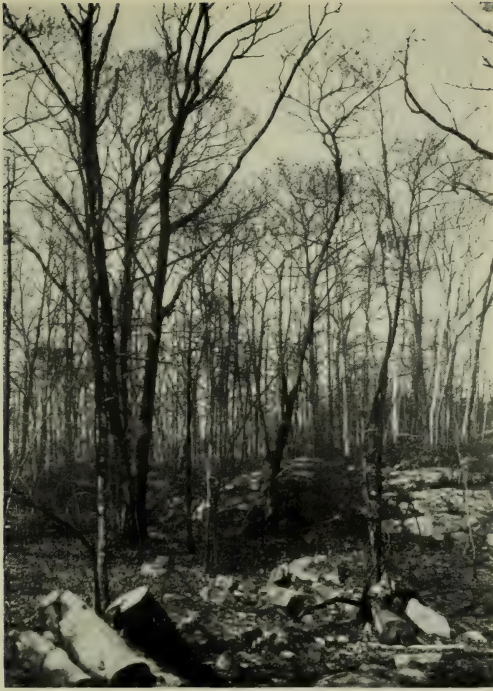
Marblehead. — The gypsy moth infestation in this town throughout the residential section is very light, but in some of the woodlands there are some quite severe colonies. The work has been handled in a most excellent manner, and good results have been obtained. The interest shown by the people and public officials in general has been very good, and if the work is carried on in the same careful manner as in the past, the gypsy moth infestation will not be of noticeable character in the future.

Marion. — The gypsy moth infestation appearing in this town two years ago has been apparently stamped out; at the present time only one colony is now known. Work has been done efficiently and in a thorough manner.

Marlborough. — The infestation of this town is general and severe in some localities, especially in the wooded areas. Work has been carried on exceptionally well for the past season, but the gypsy moth infestation was fast becoming a serious problem, owing to the fact that the work had not been done in a thorough manner the previous season. There has been in general good interest shown in the work, and the residential section is fast getting into good condition. The brown-tail moth infestation is general.

Marshfield. — The gypsy moth infestation of this town is general throughout the residential section, although not as yet severe. Considerable increase has been shown over last year, but the total of egg clusters treated this year has not exceeded 3,000. A greater part of the residential section can be handled by creosoting alone for the coming season. The town, however, should be complimented on the conditions of the orchards, as they are probably in better condition here than in any town in this section. About 75 per cent. of the residential property of this town is on a self-supporting basis. There are many large woodland colonies which are being cared for by the owners. Considerable interest has been shown by woodland owners co-operating in a financial way. The supervision of the work has been excellent, and very good interest is being shown by all local officers.

Mashpee. — The infestation of this town by the gypsy moth is becoming quite general. Fourteen new colonies have been located in the woodlands this year, two of them serious. The old colonies, where work was done last season, with one exception, showed considerable improvement. The town as a whole is apparently in worse condition than a year ago, but this may be due to the fact that much more thorough scouting was done this year; also, the local force is gaining experience each season. Officials are



Back forest where no work was done. Trees stripped of their leaves in July, as though it were winter.



Magnolia. Foreground not sprayed, background cared for. Spraying is effective if properly done.

somewhat handicapped in bringing about results owing to the fact that nearly the whole town is woodland. All the work done against the gypsy moth is hampered in this way, although the property owners, where gypsy moth colonies have been located, have been very liberal in their expenditure of money in making the fight against the moths, and town officials have shown excellent interest.

Mattapoisett. — The gypsy moth having been found in this town for the first time only a year ago, the infestation as far as apparent is very light. During the caterpillar season only 2 caterpillars were found, although burlaps were applied near the original infestation. During the fall scout 2 small gypsy moth infestations have also been located. The brown-tail moth infestation is much more serious, and considerable damage will be done if the work is not prosecuted in a very thorough manner this winter. Considerable work has been done by the Village Improvement Society on the shade-tree pests in general, as it has contributed towards paying for the elm-leaf beetle work, and this work has been beneficial to some extent against the brown-tail moth also. Although the gypsy moth infestation of this town is very light, the officials in charge of the work should interest themselves to the fullest extent, and take every possible means to keep it in check, as, if the infestation is allowed to increase, the future cost will be very large, and considerable damage done.

Maynard. — The gypsy moth infestation in this town is less than last season. Much tinning has been done in the orchards, but there is much more to do. What has been accomplished has shown very good results. The work has been managed in a very efficient manner, and good interest shown by the local officials. The brown-tail moth infestation is severe in some localities.

Medfield. — The gypsy moth infestation of this town is quite general, but the result of last year's work is excellent. All the known infestations were cared for in a painstaking manner, and the supervision was excellent. This town should have a power sprayer, so that more spraying could be done in the known woodland colonies, which are in their first stage. By this means they will not increase to any extent.

Medford. — The gypsy moth infestation in this city, as is well known, some years ago was of a very serious nature, but at the present time the residential section is in excellent condition, also a great part of the wooded areas. Through the co-operation of one of their public-spirited citizens, the late General Lawrence, a very large amount of work in the woods in the town was done, and in the past season this woodland was cared for by the city. The people have shown an excellent spirit and supervision has been efficient, the spirit throughout the town being the very best.

Medway. — The gypsy moth infestation is quite general, and the scouting which is being done at the present time discloses some increase over last year. Considerable tin patching and orchard work should be done. While the supervision was very good, there was not a sufficient

amount of spraying done, and this is the reason for the increase. The town should provide itself with the necessary spraying apparatus.

Melrose. — The condition of this city has improved somewhat in the past season, although co-operation throughout the city in general has been limited. Sufficient funds have not been available to do the necessary work for the past three years, and but for the assistance derived from natural channels this city would be in a very serious condition. Fortunately, the wilt disease of the gypsy moth and the fungous disease of the brown-tail have been prevalent here, and the parasite laboratory being located in this city, parasites have been liberated in this section to a considerable extent, and are doing more or less good. However, more work should be done in the residential sections for several years to come than has been possible during the last few years with the limited amount of funds which have been available. The residential property has not been cared for in a systematic manner, therefore a great many public-spirited people who are willing to clean their estates have been obliged to suffer from their neighbor's neglect. It is hoped that in the coming season a sufficient amount of money will be appropriated and the proper spraying apparatus purchased, and more thorough work done in general throughout the residential section of the city. The brown-tail moth infestation is general.

Mendon. — The gypsy moth infestation of this town is very light. The work which was done in the few known infestations in the last year was attended to in a very creditable manner, and very good results obtained. The interest taken by the local officials is generally good.

Merrimac. — This town is generally infested. The highway trees were cleaned and sprayed last year, and with few exceptions they are in good condition. Bad infestations occurred on Birch Willow Road, which has been cut out this fall. Newton Road, which is also in quite bad condition, will be taken care of by the government. As considerable roadside cutting is still needed, the amount of help from the State should not be reduced. The private property, with few exceptions, will pay for itself. Cutting has been done wherever needed on the highways, and as the grass comes in rapidly here, the work is noticeably lessened each year. The brown-tail moth infestation is much lighter than last year. A planting of fungous disease in the sprout land off the Newton Road looks very promising.

Methuen. — This town is generally infested by the gypsy moth, and quite severely so in some places, although a very much improved condition exists over last year. There has been exceptionally good interest taken in the work, the town having provided itself with a large spraying outfit, and a very large amount of spraying was done the past season. The supervision has been of an excellent quality, and the general interest in the work throughout the town is very good. The brown-tail moth infestation is also much less than last year.

Middleborough. — In some parts of the town the gypsy moth colonies are very serious; about 50 acres were stripped last caterpillar season.

Tanglefoot was used in some cases and very good results were obtained. There are nearly 300 known woodland colonies, but not any of large size as yet, although in some cases stripping may occur this coming caterpillar season if nothing is done to prevent it. Considerable spraying was done here last year through the residential section, also some woodland work, with very good results. Fall work was begun in the early part of October, and a thorough scout was made later on. Considerable tin patching put the orchards in first-class condition. This work is still in progress at the present time. Through the effective work done last season there are but very few infestations on street trees at the present time. Owing to the fact that a large part of the woodland in Middleborough is pine, if the gypsy moth infestation is allowed to become of a serious nature it will cripple the boxboard industry of that section to a great extent. Up to last year the work in this town was not done in an efficient manner, and this is the reason why such a general infestation occurs at the present time, but during the past year the work has been done very thoroughly, and we feel that considerable credit is due the selectmen and local superintendent for the interest shown in the work.

Middleton. — The town is generally infested. A large part of the highway work has been done by the government. This work, together with cleaning, spraying and bush scythe work, has put the trees in good condition. The cleaning and thinning done in the old cemetery at the corner of King and South Main streets has done away with a breeding place of the moths. As the government will turn much work back to the town next year, the help from the State should not be reduced. About \$60 is lost on private property in Haswell Park and Highland Park; otherwise the private work is self-supporting. The brown-tail moth infestation is very light.

Milford. — The gypsy moth infestation of this town is scattered, and shows considerable improvement over last year. Probably the use of arsenate of lead in spraying will be adopted for the coming season. Supervision has been done in an excellent manner, and public interest has been very good.

Millbury. — The gypsy moth infestation in this town the past season was confined to 3 egg clusters on three estates. These places were bur-lapped and carefully watched, no gypsy moth caterpillars being found. So far this fall scout has not developed any new infestations. The work is being carried on in a careful and thorough manner.

Millis. — The gypsy moth infestation of this town is scattered, and shows a considerable improvement over last year. More spraying will be needed in the future than has been done in the past. The supervision of the work has been very able, and the interest in the work generally very good.

Milton. — The gypsy moth infestation in this town is general all over the town. The residential section, both street trees and private estates is in very good condition this fall, but in the woodland there is still much

work that might be done. Creosoting was done last winter, and the infested places were sprayed during the summer season. A few plantings of the wilt disease were made last spring, but the disease did not work on the young caterpillars until after they had pupated. However, the woodland colonies this fall seem to be in good condition, very few nests being found. There were about 18 acres stripped here last season.

Nahant. — The gypsy moth infestation of this town is general, though not severe in any locality. The work is being cared for in a very careful manner each season, and the results obtained have been very good. The interest shown by the local officials is excellent.

Natick. — The gypsy moth infestation of this town is general throughout the residential section, and quite severe in a great part of the woodland area. The work has been carried on in a careful manner, good results have been obtained, and the interest shown by the local officials has been very good. This town is unfortunate in having considerable woodland, which is quite severely infested, adjoining the residential section. Some attempt has been made to care for the same, but it is such a large problem that it cannot be taken up to any extent at the present time.

Needham. — The infestation of the gypsy moth is general in the residential section and quite severe in some of the woodlands. The work has been carried on in a very excellent manner, and the infestation has never become of a serious nature in the residential section. It has been supervised in a most excellent manner, and general good interest is shown throughout the town.

New Bedford. — The gypsy moth has been found in this city in four places, 1 egg cluster in each place. These colonies were carefully bur-lapped during the summer season, and a few caterpillars found in 2 of the colonies. During the fall scout of this year no egg clusters have been found up to date. The brown-tail moth infestation is much more serious, last year nearly 200,000 webs being destroyed. The brown-tail moth work should be carried on as in the past season. Considerable attention should be given the gypsy moth infestations, so as to keep them in small numbers and prevent them from spreading. Interest has been shown by the officials in charge of the work, and we feel that it is being carried on in a very efficient manner.

Newbury. — The town is generally infested. The highway trees were cleaned along all traveled roads. Owing to trouble with the engine of the power sprayer a large part of the spraying had to be done by hand pumps, which made it expensive, and in a number of places too late to be effective. Considerable bush scythe work has been done but more is needed. The government will take over the care of Forest Street and Scotland Road, which, with work already done, should make the help needed from State much less next year. Protective work was accomplished in the woodland off Main Street, near the Georgetown line. The brown-tail moth infestation is very light.

Newburyport. — The city is generally infested. All highway trees were cleaned and sprayed, and with very few exceptions all are in good condition. Thinning is being done on the Plummer Spring Road. Protective work was done on the Bartlett woodland for the benefit of Mr. Moseley, who owns adjoining woodland which he is taking care of himself. The brown-tail moth infestation is very light.

Newton. — Although this city has shown a severe infestation for the past five years, up to within three years very little interest was taken in the work, and the city was allowed to become very seriously infested. Work was taken up three years ago in a thorough manner, and it was necessary for the city to expend large sums of money each year, which the appropriation available from State funds for this work would not allow this office to reimburse in full. The work has been carried on in a very thorough manner, both in the residential section and wooded areas, and to-day a greater part of the residential section is on a self-supporting basis, and a great many of the wooded areas are fast becoming so. General good interest is shown in this work throughout the city, both by property owners and the local officials.

Norfolk. — The gypsy moth infestation of this town is quite general, and the scout thus far has shown a considerable increase over last year. Much thorough work must be done in orchards and better methods applied; more spraying will also be necessary for the coming season. Supervision of the work has been only fair. More thorough methods and more interest should be shown by the local officials. The street trees are not generally infested; most of the infestation occurs in orchards and some wooded areas.

North Andover. — The gypsy moth infestation is general, being severe only in some sections. This town has a considerable wooded area where severe infestations occur, although the conditions on the street trees and on private property throughout the residential section are much improved over last year. In the outlying districts there are some infestations which occur on private property and on roadsides which will be cared for in the coming season. The supervision of the work has been very good. Considerable interest has been shown by local officials and large property owners. The brown-tail moth infestation is only one-half as bad as last year.

North Attleborough. — The gypsy moth infestation is very slight. The supervision has been good, and the work done in a very thorough manner. The results of last year's work were good.

North Reading. — The infestation of this town is general, being severe in the wooded areas. The residential section is in very good condition, and the supervision of the work in the past has been of good quality; where work has been done much improvement is shown. Owing to the fact that a large percentage of the town is woodland, much reinfestation occurred in a natural way, and the work is hampered to some extent on

this account. The brown-tail moth infestation is general. An excellent spirit has been shown by the officials in charge of the work, and all duties devolving on the town have been performed in a very faithful manner.

Northborough. — The gypsy moth infestation in this town in the past season was confined to about 150 estates. The fall scout has shown about the same number of infestations, although a larger number of egg clusters have been found. The interest taken by the local force does not seem to be of the best, the work being conducted under skeptical management; better supervision must be given and more thorough work must be done the coming season. The work should be in charge of some one who will take general interest, and who will try every means to combat these pests in the best possible manner.

Northbridge. — The infestation of this town is very light, although scouting has not as yet started. The gypsy moth occurs in but few places. The work has been handled in a proper manner, and considerable interest has been shown by the local officials.

Norton. — This town is lightly infested with the gypsy moth, as it occurs only in very few places. All necessary work has been done the past year, and considerable interest has been shown in the work against the pest.

Norwell. — The gypsy moth infestation is general throughout the residential section and quite serious in a large part of the woodlands. The residential section is in much better condition than the past season, as a large amount of spraying was done throughout the town. A great part of the residential estates is on a self-supporting basis. Much orchard work will be necessary the coming season. There are many infestations in the woodlands, and some of them are being cared for by private individuals, notably on the Cushing estate, where a large amount of work is being done. Much spraying was done here last year on woodland colonies where owners were willing to pay, and very good results obtained. The brown-tail moth situation in this town is much worse than a year ago, for reasons unknown. The supervision has been of a good quality, and general interest has been shown by townspeople.

Norwood. — The gypsy moth condition of this town is very bad, a great deal worse than last year, and has been continually growing worse for the past two or three years. The interest taken in the work has been very poor, and the work managed in an improper manner. The funds have not been forthcoming, and a very small portion of the work has been done. More interest, better supervision and more funds will be necessary for the coming season's work, and if the work is not taken up by the town in a more thorough and efficient manner, it will be necessary to take steps to ensure its being carried on in a proper way.

Orange. — The gypsy moth infestation here last season was confined to two places with 1 egg cluster on each estate. These were carefully watched during the caterpillar season, nothing being found. The town will be scouted this year by the government.

Orleans. — Last season 1 gypsy moth colony was found here. It was located by our division superintendent, burlapped and sprayed, and watched during the season, most of the time by him. One egg cluster has been found, also by the division superintendent. The brown-tail moths are numerous and scattered. The interest taken by local officials does not seem to be sufficient, and the work has not been attended to in a satisfactory manner; probably this is because they do not realize the danger that is before them. If the colony which is now located is cared for, it may possibly be stamped out. The situation would be easier to handle then than if they wait until a severe general infestation occurs in the town. More interest must be taken in the work.

Oxford. — The infestation here was confined to 1 egg cluster, nothing being found in the caterpillar season. In doing the brown-tail moth work this fall, 1 gypsy moth egg cluster has been discovered, but a general scout will be made by the government forces later. The work is being carried on in a very careful manner by the local officials.

Palmer. — In 1907 this town was found to be infested. The infestation is apparently stamped out, as nothing has been found since.

Paxton. — Five infestations discovered the past season have been carefully watched and nothing has been found since. This town will be scouted by the government forces this season.

Peabody. — The gypsy moth infestation is general, and severe in some parts, especially in the West Peabody district, where but very little work has been done during the past three years, owing to lack of funds. The residential section in Peabody proper is in very good condition and supervision has been of excellent quality. There has been some opposition on the part of local officials to engaging in co-operative arrangements which have been suggested by this office, so that the funds which were made available by the town have not been made to cover as much work as would have been possible by co-operating with the State. For instance, the town might have had supplies from this office for 20 per cent. of their cost if these arrangements had been made. About 30 miles of roads which were recently looked after by the government have been turned back to the care of the town, and this will increase the work for the town to do. In the West Peabody section of the town a very large amount of work will be necessary the coming season to suppress the gypsy moth. Many of the roadsides will need thinning, and a very large amount of spraying and winter cleaning will be necessary. We also feel that the town should purchase more spraying apparatus, owing to the large areas it has to cover.

Pembroke. — The gypsy moth infestation is scattered throughout the town; through the residential section it is quite general, but shows much improvement over last year. The scouting of the residential section has been completed, and the total number of egg masses treated this year is less by thousands than a year ago. The supervision has been of an excellent quality, and very good results obtained. The woodland problem in this section is the same as in other towns in this locality, and it will be necessary

to continue the thorough work the same as in the past, or, in other words, as long as the light infestation can be held in check by creosoting alone. Only one bad outbreak has occurred in this town, this being located near the North River, but it is being cared for in a very thorough manner, and it is hoped that the spread from this colony can be prevented.

Pepperell. — In 1907 only 4 gypsy moth egg clusters were located in the town; at the present time the gypsy moth infestation is general throughout the town. The woodland promises to be a very serious problem in the near future, and in East Pepperell village some serious infestations occur in the residential section. Considerable work will be necessary the coming season, and it seems that the officials and property owners of the town realize the danger ahead of them, as they are taking a very active interest in the work. We recommend that a power sprayer be purchased by the town for next season as it will greatly help the work, and also save money in the end. The brown-tail moth infestation is general.

Petersham. — Three infestations were discovered here last season, which were carefully watched. Nothing more developed. This town will be scouted by the government forces this season.

Phillipston. — The gypsy moth infestation in this town is confined to 2 colonies of 14 egg clusters, which were burlapped and carefully watched during the caterpillar season. In 1 colony several caterpillars were found. The fall scout has not been started, owing to the fact that the government forces will take up the work later.

Plainville. — The gypsy moth infestation is light, and the work last season was done in a very efficient manner, with the best results. The supervision and interest by the local officials have been excellent.

Plymouth. — The gypsy moth infestation is scattered over the entire town, and the scouting in the residential sections this year shows it to be general, but the total of egg clusters treated is not much more than last year. Considerable burlapping and spraying were done here last year, with very good results. The work has been supervised in an excellent manner, and many woodland colonies are being treated by the town forces, with good results. This town is very unfortunate in having a large number of ponds, and infestation is scattered generally about these places, although no serious outbreak has as yet occurred, and we think that the moths can be held very well in check by good thorough work the coming season.

Plympton. — The gypsy moth in the residential section is shown in this fall scout to be more generally scattered than a year ago, although the infestations are not of a serious nature, and the greater part of the residential section is on a self-supporting basis, or will be in another year. The gypsy moth in the woodland of the town is generally scattered, and in some places occurs in quite large numbers, although considerable work has been done. There is a large area of pine timber land here. So far the colonies have been handled in a very creditable manner, and have not

been allowed to increase to any great extent. The interest shown has been very good. The brown-tail moth infestation is very light.

Princeton. — This town showed 6 infestations of the gypsy moth last season, which were burlapped and carefully attended. Several caterpillars were found in some of the localities. The fall scout has not yet been started, and in all probability some egg clusters will be discovered this fall, owing to the existing conditions in one of the colonies.

Provincetown. — The gypsy moth was found here for the first time last spring, 200 egg clusters being found in 1 colony, and quite a few smaller colonies in the immediate vicinity. The infestation was closely watched during the past season and greatly reduced. More spraying should be done the coming season. The brown-tail moth is quite plentiful. Supervision has been very good, and local officials have shown considerable interest in the work against the moths.

Quincy. — The gypsy moth infestation throughout the residential section is general and quite severe in some parts of the city. In nearly all of the woodland the infestation is serious. Work has been carried on here for the past few years, but has not been prosecuted as thoroughly as it should have been. The necessary funds have not been forthcoming. The city officials have not taken the proper interest in the work, and never has a large amount of money been available in any one year to carry on the work to the extent which it should have been, so to-day there are several sections which are in very bad condition, and larger sums of money should be made available for the moth work. Supervision for the past season, so far as funds allowed, was of a much better quality than before.

Randolph. — Gypsy moth infestation is general and quite severe in some places. The work has been handicapped somewhat in the past by not having sufficient funds at the proper time. The necessary funds to carry on the work should be forthcoming, and more thorough work and better methods must be adopted.

Raynham. — The gypsy moth was found here first in 1905, and the infestation has shown a slight increase each year; 8 new places were found last year, comprising 30 egg clusters, making a total of 15 colonies that have been found. Three of these colonies have apparently been stamped out, as nothing has been found in them for two years. Considerable work has been done in the fruit orchards, where infestations were found in 1910. We advise that more thorough work be done in this town in the future, and spraying be carried on to a larger extent than in the past, as it is very apparent that the gypsy moth is on the increase, and every known method should be used to keep it down. Our inspector in charge of the work reports that scattering infestations have been missed by the local men. The instructions given by the representatives of this office should be carried out, and in this way much better results may be accomplished. It is very important that the work be taken up in a more efficient manner, as the amount the town is required to expend is very small, and it will

be necessary to call upon the State for funds; the amount of reimbursement to the town should not exceed that of past years if possible.

Reading. — The gypsy moth has been found in all parts of the town, although the residential section is in excellent condition. The woodlands are seriously infested throughout. The supervision of the work has been of a most excellent quality, and the results obtained are very gratifying. This town, like several others, has been handicapped in the present year to some extent by the fact that several miles of roadsides, which were previously cared for by the government, were turned back to the care of the town. This will necessitate increasing the expense slightly for the coming season. The brown-tail moth infestation is general. Throughout the residential section the shade trees are very lightly infested, and probably will not need much spraying for the gypsy moth, therefore the town should provide liberally for the care of its trees infested with the elm-leaf beetle.

Rehoboth. — Thirteen infestations of the gypsy moth have been located in this town, ranging from 1 egg cluster to 16 in a colony. All colonies were burlapped during the summer season, and some were sprayed. So far this fall 2 new egg clusters have been found. A very thorough search should be made for the gypsy moth during the winter season, owing to the fact that so many infestations were located last year.

Revere. — The gypsy moth infestation is quite general and serious in some of the woodland areas, although for the past two years the work has been handled in a most excellent manner, and the residential section is fast coming into good condition. There is very good interest shown, although there was some trouble experienced with the town officials two years ago. For the past season the interest seems to be more general.

Rochester. — The gypsy moth infestation in the eastern part of the town has been well cared for, and is apparently in much better condition than a year ago. The other gypsy moth infestations have also been held in check, and no increase is noticeable. One colony appears to have been stamped out entirely. Excellent interest is shown in the work by the town officials, and the work is carried on in a very satisfactory manner.

Rockland. — The gypsy moth infestation in the residential section is quite general and possibly somewhat worse than a year ago, although no serious infestations as yet occur. The work has been supervised in an excellent manner, and very good interest shown. The woodland colonies have been taken care of so far, but considerable more scouting of woodland will be necessary this year. The brown-tail moth infestation is general but very light.

Rockport. — The gypsy moth infestation is general and severe, although in the residential sections great improvement is shown over last year, owing to the fact that a larger amount of spraying was done than in the past. The work has been supervised in a very efficient manner, and local officials have taken an active interest in the work.

Rowley. — The town is generally infested by the gypsy and brown-tail

moths. A large part of the highway work here has been done by the government the past year; that done by the town consists of cleaning, spraying and clearing brush where needed. With few exceptions all trees are in good condition. As the government will turn back many of the roads to the town to care for next year, the amount of help from the State should not be reduced. Private property, with few exceptions, will pay for itself. The brown-tail moth infestation is very light. A planting of brown-tail fungus in the sprout lands near the Boxford line promises good results.

Royalston. — The infestation of this town the past season was confined to 14 estates, with a total of 20 egg clusters. These colonies were burlapped and watched during the caterpillar season, caterpillars being found in nearly every colony. The winter work was not done in the most careful manner, which accounted for the fact that caterpillars were found in nearly all locations. More careful work must be done by the local forces in the future, as in the fall scout, which is being conducted by the government forces at this time, over 200 egg clusters have been discovered.

Rutland. — The gypsy moth infestation is confined to 4 estates with a total of 25 egg clusters. These places were burlapped and carefully watched during the caterpillar season, and a number of larvæ were found. The work is managed in a very careful manner, and general interest taken. The fall scout has developed about 3 egg clusters to date, the town being about half done.

Salem. — The gypsy moth infestation is general, and severe in some places. As this city a few years ago was very severely infested throughout, a great gain has been made against the moths. The work has not been along most efficient lines here, owing to the interference of some of the local officials. At the present time the street trees are in fair condition, somewhat better than last year, and private property in general is in better condition. The immediate supervision of the work from a local standpoint has been very good, when it has not been hampered by city officials.

Salisbury. — The town is generally infested. All street trees on traveled roads were cleaned and sprayed. Bush scythe work has been done on most of the highways, but more is needed. More cutting is needed on several of the cross roads. Trees at present are in good condition, and private property, with few exceptions, will pay for itself. The amount of help from the State should not be reduced. The brown-tail moth infestation is generally light.

Sandwich. — The gypsy moth infestation of this town seems to be somewhat on the increase. The fall scout has shown 40 colonies, 15 of them being new ones, and one of the latter proved to be the most severe yet found in the town, containing 500 egg clusters. This is not encouraging to the property owners of the town, and possibly better supervision could be given on the part of local officials. The State representative in that section has done considerable work, but if good results are to be obtained more thorough and efficient work must be done in the future. It would

be economy for the town to purchase a power sprayer. The brown-tail moth was very prevalent the past season.

Saugus. -- In 1905 this town was one of the worst infested sections of the State, and a very hard and systematic fight has been necessary to bring about the present conditions, which are extremely good in the residential section. All the wooded areas, where little work has been done, are in very bad condition, although woodland property owners in the town have shown much interest, and co-operated in the best possible manner, allowing their wooded areas to be cared for where the growth was very valuable and an asset to the town. The work at the present time is being supervised in an efficient manner, and good results are obtained. The brown-tail moth infestation is general. During the coming season more spraying outfits should be obtained, as those which are now on hand have been used in the work for the past five years, and are practically worn out. The shade trees are in excellent condition, and probably will not need spraying to protect them from the gypsy moth, therefore the town should provide necessary funds to carry on the elm-leaf beetle work.

Scituate. — This town is seriously infested throughout by both the gypsy and brown-tail moths. It is quite safe to say that the worst brown-tail moth infestation in the State probably occurs here. The town attempted to handle the gypsy moth without doing much roadside cutting, owing to the fact that there is considerable shrubbery which was beautiful and much admired by the summer residents. The infestation has become so serious that it has been necessary to do considerable thinning and general cleaning of road sides in the residential section, and during the past season a large amount of work has been accomplished. If it is continued on the same scale as it has been for the past few months, the town may be put into a condition where the work can be handled very easily and economically. The most unfortunate thing is the expense which the town must be put to in relieving its residential section of the brown-tail moth webs. The supervision is very good, and excellent interest has been shown by all.

Seekonk. — One gypsy moth infestation has been located in the town. Trees were burlapped during the summer season, and no caterpillars found. A thorough search will be made of the entire town this year for new infestations. The brown-tail moth infestation is general but light, being the heaviest near the Rhode Island line. Fall work is not in progress at the present time, but should be started at an early date.

Sharon. — The gypsy moth infestation of this town is quite general. The scout has now been going on two or three weeks, and shows no apparent increase in the moth so far. Supervision of the work has been very fair, and the results obtained have been good.

Sherborn. — The gypsy moth infestation is quite general, although considerable improvement is shown over last year. There still remains much work to be done in the orchard colonies. The supervision of the work is very good, and considerable interest is shown by the town in general.

Shirley. — The gypsy moth infestation is general, and quite severe in some parts of the town; the brown-tail moth infestation is bad generally; also there is some increase of the gypsy moth. The work has been carried on in a very efficient manner for the past season. The town has purchased a spraying machine, and the work can be handled much more economically and more efficiently the coming season.

Shrewsbury. — The gypsy moth is generally scattered throughout the town, although the infestation is very light. The fall scout has developed a great many more egg clusters than last year, and this office is convinced that the supervision is not of a good quality. During the coming season much more thorough work must be done, and more interest taken generally by the local officers.

Somerville. — The infestation of the gypsy moth is general throughout the residential section, which comprises the greater part of the city. The work has been carried on in a very careful manner for several years, and during the past season very good results were obtained. Good interest is shown by all.

Southborough. — The gypsy moth infestation is general but light, being quite scattered throughout the town. Careful work has been done against both the gypsy and brown-tail moths. The brown-tail moth work has been carried to excess if anything, as the woodlands were cared for as well as the residential section. This does not meet with the approval of this office, as we do not feel that we can afford to expend money on brown-tail moth work in woodlands. The supervision has been excellent, and extremely good interest taken in the work.

Spencer. — So far as known there is no gypsy moth infestation in this town. The brown-tail moth is generally scattered over the town.

Springfield. — In 1907, 1 egg cluster was discovered in this city. Nothing has been found since, and the city has been scouted twice.

Sterling. — The gypsy moth infestation is quite general, although not severe. Nearly every orchard in town has a light infestation, necessitating considerable orchard work being done the coming season. The work has been carried on in a very careful manner, and general interest has been shown by the local officials. The brown-tail moth infestation is light.

Stockbridge. — The gypsy moth was found in this town some time in the early part of August this last summer, and immediately a representative was sent from this office to determine the extent of the infestation. Later, the town provided sufficient funds, and experienced men from this department were employed by them to make a thorough scout, with the result that about 300 egg clusters were found, mostly all located in one section, and several single-nest infestations have been located in other sections of the town. Good interest has been shown in the work by the property owners and town officials, and it is believed that everything possible will be done to stamp out the gypsy moth.

Stoneham. — The gypsy moth infestation in this town is now general. Like others in the same section several years ago, the infestation

was very severe. Woodland conditions are somewhat improved through natural causes, though but a small part of the wooded areas has been cared for by hand-suppression methods. The residential section is in excellent condition, and should be cared for in the future with very little expense to the town. The brown-tail moth infestation is general. It is recommended by this office that spraying apparatus be provided, so that the work may be carried on along more economic lines. The supervision of the work is of a very high quality, and the work very economically managed generally.

Stoughton. — The gypsy moth infestation is quite general but light, with only a very few severe infestations. The supervision of the work has been good. Very fair results were obtained in last season's work, and good interest has been shown by the public officials connected with the work.

Stow. — The gypsy moth infestation of this town is general and severe in some places. The work during the past season consisted in creosoting of egg clusters in the winter and burlapping in the summer, with very fair results. The supervision of the work was generally good, but the infestation has increased to such an extent that more thorough work will be needed for the coming season and better methods must be adopted. There is considerable orchard and roadside work to be done, and roadside thinning where infestations exist. The brown-tail moth infestation is bad.

Sturbridge. — The gypsy moth infestation in this town was confined to 2 egg clusters the past season. These colonies were burlapped and attended to in a very thorough manner, nothing having been developed since. The town will be scouted this year by government scouts.

Sudbury. — The gypsy moth infestation of this town is general and severe in some places. The work during the past season has consisted in creosoting of egg clusters and burlapping, and has achieved very fair results. The supervision has been of a good quality, but the infestation has increased to such an extent that more thorough work will be needed for the coming season, and better methods must be adopted. There is considerable orchard and roadside work to be done, and roadside thinning where the infestation is serious.

Sutton. — The infestation in this town is confined to 8 estates, in which 9 egg clusters were found the past season. The work has been done in a most excellent manner and been carefully supervised. The fall scout up to date has shown nothing.

Swampscott. — The infestation of this town is general throughout the residential section, and quite severe in the small amount of woodland which exists in the town. The work for the past season was prosecuted in an excellent manner, and very good supervision has been shown. The town has been handicapped considerably in the past by political complications, but during the past season this has been practically eliminated, and much better results obtained.

Swansea. — The infestation of this town was very light last season, and

so far the fall scout has showed 2 new egg clusters, not in the same colony as found last year. The work must be taken up in a thorough manner and given every attention, so as to prevent increase, if possible. The brown-tail moth infestation is general, but not considered as seriously by local officials as it should be. It will be necessary to do considerable work against both gypsy and brown-tail moths this coming season, and it should be done in a very thorough and efficient way. If the local officials have not a thorough knowledge of what should be done, this office should be asked for instructions.

Taunton. — The work of the past year has not been of good enough quality to bring about the best results, as a great many more colonies are being found on this fall scout than in previous years. This is owing to the fact that the officials in charge of the work were not accustomed to searching for gypsy moth egg clusters and consequently many escaped their notice. The work against the gypsy moth should be taken up in a very thorough manner, and spraying done where necessary. The liability of this city, \$5,000, should be sufficient to carry on the work, and it should not be necessary for the State to reimburse the city if the work is handled in a proper manner. The brown-tail moth infestations are not as plentiful as last year, and will not need a great deal of attention. The work will be practically self-supporting, as the greater part is on private property. A power sprayer would be a great assistance in the work the coming year, and we recommend that the officials interest themselves in the matter of purchasing one.

Templeton. — The gypsy moth infestation is confined to 14 estates, showing a total of about 40 egg clusters. These colonies were burlapped and very carefully attended, and several larvæ were found. The scouting this fall has shown about 150 egg clusters in different sections of the town. The infestation here promises to be quite serious, and must be attended to in a very thorough manner. Very good interest is shown by the local officials.

Tewksbury. — Gypsy moth infestation is general and severe, although throughout the residential section very good results have been obtained. More spraying will be necessary for the coming season, and the town should be provided with a power sprayer. The supervision has been of good quality, and general good feeling toward the work exists in the town. The brown-tail moth infestation is also very much less than it was last year.

Topsfield. — The town is generally infested by both the gypsy and brown-tail moths. The highways are generally in good condition where thinning operations have been carried on, though there were a few bad trees on Rowley and Bridge streets and the Hamilton Road. This was probably due to the fact that the power sprayer did not get here from Boxford soon enough. Considerable cutting and clearing have been done. There is a light brown-tail moth infestation. The work done by the government has greatly reduced the expense here. The private property is self-

supporting. The amount of reimbursement from the State can safely be reduced next year.

Townsend. — Although the gypsy moth has been in this town only four years, starting with 1 egg cluster in 1907, at the present time the egg clusters which have been treated in the fall scout are numbered in the thousands. The gypsy moth egg clusters are plainly to be seen in all parts of the town, with the exception of the center, which appears to be in very fair condition. Much thinning along the roadsides is needed, and tanglefoot should be used next season. Spraying will be necessary in nearly all parts of the town. The brown-tail moth infestation is also general. It is recommended by this office that the town provide a power sprayer. The work has been well supervised, and the town officials have shown a very creditable interest.

Truro. — One small gypsy moth colony was found by the division superintendent the past season. The brown-tail moth is very plentiful. It is hoped that in the future the local officials will take more interest in the work, and have it carried on along more systematic lines.

Tyngsborough. — The gypsy moth infestation is general and severe, although improvement has been made on the street trees and private property work in the residential sections. Considerable more spraying will be necessary in the town the coming season. The town should also provide itself with a power sprayer. The supervision has been good, and a general interest has been shown in the work by the officials and townspeople. The brown-tail moth infestation is about half as bad as last year.

Upton. — The gypsy moth infestation in this town is light but scattering. The town will probably be scouted this winter. The brown-tail moth infestation is not bad.

Uxbridge. — There are but a few gypsy moth infestations, and these have been well cared for the past season. Very good interest has been shown generally in the work.

Wakefield. — The gypsy and brown-tail moth infestation of this town is very general, although the residential section, in regard to the gypsy moth, is in fair condition. In the woodlands the infestation is very serious. Excellent work has been done in the way of thinning, cleaning and burning, although the methods employed in treating the egg clusters and spraying are not in accordance with those used by this office. This work should be done in a more systematic and thorough manner, especially the search for gypsy moth egg clusters, as many have been found after the local forces, when they were cleaning private estates. The local officials in charge take an active interest, and if the changes in methods of work, as above suggested, were made, we feel that excellent results could be obtained.

Walpole. — The gypsy moth infestation is quite general, although not severe, but the fall scout seems to show a few more infestations than last year. Work was done in a very fair manner, although not as much vigor

was shown by the local officials as should have been. In the coming season more thorough and efficient work should be done, and more spraying also.

Waltham. — Up to two years ago this city was in a very serious condition, both in residential sections and woodlands. The city officials did not co-operate with the State, and the work was cared for in a very inefficient manner until two years ago, when the management was changed. For the past season the work has been carried on in a most excellent manner, and good results have been obtained, so that the residential section to-day is in very good condition, and good work has been done also in some of the wooded areas, especially Prospect Hill Park, where considerable burlapping was done, the results obtained being extremely gratifying.

Wareham. — All the old gypsy moth colonies in this town are apparently extinct or in very good condition. The fall scout has not yet begun. Two colonies were found during the year by the State superintendent, and 1 was reported by the local superintendent of Rochester. The town has been very generally infested but has had only 2 bad colonies. The brown-tail moth is fairly numerous in the Onset section.

Warren. — This town was found infested by the gypsy moth in 1908, but nothing has been found there since. We believe that the moths have been stamped out.

Warwick. — This town was found to be infested last year, 33 egg clusters being discovered. A scout has been made this season by the government forces, and 4 egg clusters found. A local moth superintendent has been appointed to attend to the necessary work.

Watertown. — This town being almost entirely residential, it is generally infested with the gypsy moth, although seriously in but very few localities. The work has been carried on in a very efficient manner, and considerable interest has been taken by some of the town officials. The work in the town should be self-supporting throughout the residential section. The problem of caring for the town should be exceptionally easy from the fact that it has no woodland.

Wayland. — The gypsy moth infestation is very serious throughout the town, although the residential part has been very well taken care of. Considerable difficulty was experienced in getting the work done in a thorough manner several years ago, but for the past two years it has been well done. Property owners have co-operated, and the wooded areas, comprising a greater part of the town, have been partly cared for by co-operative measures. Another sprayer should be available for next season's work.

Webster. — This town was scouted the past season during caterpillar time, and caterpillars were found on 2 estates. The infestations were carefully watched during the remainder of the season, nothing being found. This town will be scouted by the government scouts this season.

Wellesley. — The gypsy moth infestation is general, and is severe in a great many localities, although in the residential section most excellent

work has been done in a fairly permanent way. Considerable interest is shown by the owners of large estates in the town, and a good deal of the work is done co-operatively. The interest taken by the people in general has been exceptionally good.

Wellfleet. — The gypsy moth infestation of this town is located in one of the town centers, and was cared for in a very efficient manner the past season, showing good results. The brown-tail moth webs are very plentiful. Officials are taking excellent interest in the work.

Wenham. — In this town the worst gypsy moth infestation occurs in the woodland, the residential sections being in very fair condition. The street trees are in somewhat better state than last year. On private property not much improvement has been shown. There are places where the work has been done continually for several years, but these are not as yet on a self-supporting basis. This condition should be the special study of the local forces, and these estates made to become self-supporting as far as possible. The supervision has been very good, and interest is shown by large property owners in caring for their estates.

West Boylston. — The gypsy moth infestation in this town is generally scattered, although quite light; nothing serious has as yet developed, but conditions promise to be so unless careful attention is given the work. Supervision is of very good quality, and general interest is shown in the work.

West Bridgewater. — The gypsy moth infestation is general and quite severe in some places. The fall scout shows the infestation to be much more scattering than last year. For the coming season it will be necessary to do considerable work, such as tin patching and removing of dead wood and brush, and we feel that it will be necessary to do more spraying and less burlapping. In this way more efficient work could be done with no increase in cost. More attention should be given to the charges to property owners. The supervision has not been as thorough as we would have liked, and more interest should be taken in the work for the coming season.

West Newbury. — The town is generally infested. Nearly all highways have been kept in good condition, with the exception of the willows on Crane Neck and Ash streets, which are bad. These and many others will probably be cut this winter. Cutting, cleaning and spraying have been done where needed. More work of this kind will be needed undoubtedly next year. The private property work is self-supporting. The help from the State for next year can be reduced. The brown-tail moth infestation is generally light, and sprout lands between Ash and Crane Neck streets have been planted with fungous disease, which at present looks promising.

Westborough. — The gypsy moth infestation is generally scattered, and bad in several places. The supervision in the town has not been up to the standard, and general interest is not shown in the work. During the coming season much better and more thorough work must be done in

order to cope with the situation, so that a serious infestation may not develop throughout the town.

Westford. — The gypsy and brown-tail moth infestation of this town is of a serious nature throughout, owing to the fact that there is but a small part of the town which could be considered a residential section. With the severe infestations in the woodland areas, the possibility of making good gains against the gypsy moth is very hard, although the work has been carried on in an efficient manner, and the supervision has been of good quality, but the general condition is one which prevents better results being accomplished. There are a few places in the residential section that are in good condition, but the greater part of the town is causing considerable anxiety as to the future. The town officials co-operated willingly with this office, and have shown interest in the work.

Westminster. — The gypsy moth infestation in this town is general, although not severe as yet. The fall scout this year has developed a great deal worse conditions than last year. The work has not been carefully supervised, nor done in a thorough manner. It is recommended by this office that a change be made, so that the supervision may be better and the work may be done more thoroughly and carefully.

Weston. — The gypsy moth infestation of this town is very serious as a whole. The residential section is in very good condition, but comprises but a small part of the town. There are a great many large estates and the work has been taken up and carried on in a very thorough manner, the general supervision of the work being excellent. The co-operation of the people owning large estates has been good and helpful to the work, and a movement is now being started to do considerable of the woodland work in a co-operative manner throughout the town. This office has had made a complete plan of all estates in the town, and submitted it to a committee which has in charge the work of obtaining co-operation from woodland owners. The expenditures in the town sometimes have exceeded the sums which this office has been able to reimburse, and probably as much woodland work has been done here as in any other town in the State.

Westwood. — The gypsy moth infestation is quite general, although not severe. The work for the past season has been done in a very good manner, and excellent results obtained. A number of woodland colonies were cared for with good results. A power sprayer is greatly needed by the town, owing to the number of woodland infestations which it will be necessary to handle in the future. General interest in the work has been shown in the past year, much more so than previously.

Weymouth. — The gypsy moth infestation of this town is general, and serious in several woodland colonies. The residential section is in very good condition, and the work has been supervised in a thorough manner. General interest is shown by the officials, and also by the townspeople.

Whitman. — The gypsy moth infestation is general, although the town is in much better condition than last year. The work has been managed in an excellent manner, and a greater part of the residential

work is self-supporting. There is some woodland scouting being done this year, and some small woodland colonies have so far been discovered. Street trees are in exceptionally good condition. The brown-tail moth infestation is very light and general good interest is shown by all.

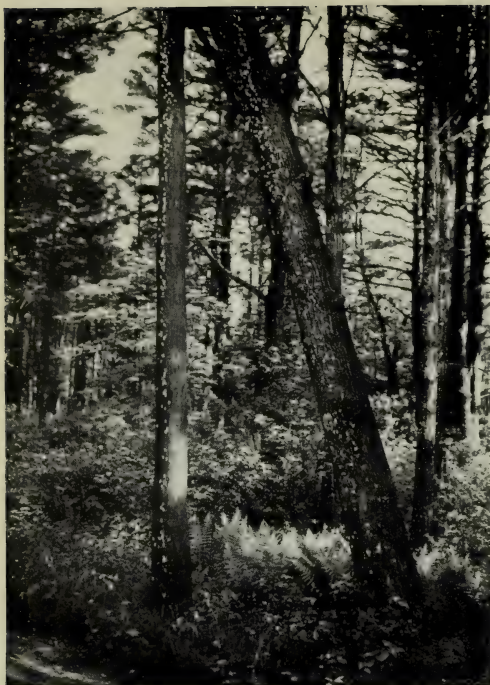
Wilmington. — The gypsy and brown-tail infestation is general, and serious in the wooded areas. The residential sections, although but a small part of the town, are in very good condition. The work has been carried on in a very efficient manner, and the supervision has been of good quality; owing to the fact that so much of the town consists of badly infested woodlands, it is hard to make definite gain against the infestation. The interest taken by town officials has been helpful to the local superintendent, but the moth situation in general promises to be an up-hill fight for some time to come.

Winchendon. — The town is generally infested with the gypsy moth, and so far the scout this season shows that the conditions will be much worse the coming year. The work has not been supervised in a satisfactory manner. As it is now under new management, it is hoped that more effective work will be done and better results will be obtained the coming season. The people of the town are generally interested in the work.

Winchester. — The gypsy and brown-tail moth infestation of this town is general, and quite serious in some of its wooded areas. The gypsy moth has increased somewhat in the past three years, owing to the fact that sufficient funds have not been provided. The town has also been handicapped by the work of several private contractors, which has not been of good quality. The woodland area bordering on Fells Reservation, Forest Street and Andrews Hill is in very bad condition, and it is hoped that in the coming season spraying apparatus will be purchased to do the necessary work in the woodland areas, such as those bordering on residential sections and in the parks. The local officials in charge of the work have shown interest, and have done as well as they could with the funds available, but it is hoped that the townspeople will appreciate the importance of providing necessary funds for the coming season's work.

Winthrop. — The gypsy moth is generally scattered, though no severe infestations occur. The work has been done in a very good manner for the past season, and results obtained have been good. The gypsy moth problem is not a serious one here, and can be cared for very easily.

Woburn. — The gypsy and brown-tail moth infestation is general throughout the city. The residential section is in very much better condition than in the past. The principal objection to methods employed in the past has been the system of work on the private estates, which we believe will be handled in a much better way the coming season. There are some wooded areas where serious infestations occurred, bordering on residential sections, where protective belts should be made, so as to prevent reinfestation of estates where thorough work has been done. The supervision for the past season has been of most excellent quality, and city officials have taken a very active interest.



Brown-tail moths the morning after they had been attracted to the electric light, on Lake Shore Avenue, North Shore.



Spraying in the forests, with 1,500 feet of hose and a pressure of 300 to 350 pounds at the nozzle. Expense now reduced from over \$40 an acre to between \$6 and \$10.

Worcester. — The gypsy moth infestation in this city is general but light. The work is being carried on in a most excellent manner, and everything is being done to check the pest if possible. This city is located on the main road to the western part of the State and New York, and it is in constant danger of reinfestation. Good interest is shown by the city officials and people in general.

Wrentham. — The gypsy moth infestation of this town is very light, and occurs in but few places. All necessary work was done the past season and very good results obtained. Public sentiment in regard to the work in this town is good.

Yarmouth. — There are no gypsy moths, so far as known, in this town. It is generally infested with the brown-tail moth.

NEW MOTH LEGISLATION.

The following new legislation was enacted by the last General Court.

The following law was enacted, defining the rights of people aggrieved by the taxes assessed upon them by local authorities for the work of suppressing the gypsy and brown-tail moths on their property: —

ACTS OF 1911, CHAPTER 242.

AN ACT RELATIVE TO ABATEMENT OF TAXES FOR THE SUPPRESSION OF MOTHS.

Be it enacted, etc., as follows:

SECTION 1. A person aggrieved by the taxes assessed upon him for the suppression of gypsy and brown tail moths pursuant to the provisions of sections six and seven of chapter three hundred and eighty-one of the acts of the year nineteen hundred and five, as amended by chapter two hundred and sixty-eight of the acts of the year nineteen hundred and six, by chapter five hundred and twenty-one of the acts of the year nineteen hundred and seven, and by chapter five hundred and ninety-one of the acts of the year nineteen hundred and eight, may, within six months after the date of the first tax bill issued on account of the taxes complained of, apply to the assessors for the abatement thereof; and if they find that he is taxed for more than his legal proportion, or for an amount in excess of what should have been assessed pursuant to the statute under which the tax was laid, they shall make a reasonable abatement.

SECTION 2. The assessors shall not abate a tax under the provisions of section one except upon the written recommendation of the board or officer who certified the assessment in question to the assessors or provided them with the information as to the work performed, upon which such tax was assessed, unless the error or excess complained of originated in the work of the assessors who laid the tax.

SECTION 3. The assessors shall keep a record of all taxes abated under

the provisions of this act and shall preserve for three years all written recommendations received pursuant to section two. They shall furnish the collector of taxes with a certificate of each abatement hereunder, which shall relieve him from the collection of the sum abated.

SECTION 4. This act shall take effect upon its passage. [*Approved April 6, 1911.*]

In our last annual report we referred to the difficulty of obtaining efficient work in the towns lying on the border of the moth infested areas, or what are commonly called the "outlying towns," owing to the fact that the local men who are employed in such towns are unfamiliar with the habits and appearance of the gypsy moth, and lack experience in the work. We suggested the wisdom of a law which would enable the State Forester to take control of the moth work in towns where no efficient organization exists, thereby insuring thorough work, as well as reducing the cost very materially. A bill embodying this recommendation was introduced into the Legislature, and a hearing was given, when the advantages of such a law were clearly pointed out. The committee, however, amended the bill so as to give the State Forester authority to take charge of the work only in such towns as, through the proper officers, should request it.

We regret to report that notwithstanding there were several towns that would have been greatly benefited by taking advantage of the provisions of the act, only one application has been received at this office for such aid as yet.

The law, as passed, is as follows:—

ACTS OF 1911, CHAPTER 474.

AN ACT RELATIVE TO THE SUPPRESSION OF THE GYPSY AND BROWN-TAIL MOTHS.

Be it enacted, etc., as follows:

SECTION 1. Section five of chapter three hundred and eighty-one of the acts of the year nineteen hundred and five, as amended by section three of chapter two hundred and sixty-eight of the acts of the year nineteen hundred and six, and by section two of chapter five hundred and twenty-one of the acts of the year nineteen hundred and seven, is hereby further amended by adding at the end thereof the following:—The superintendent may also take complete control of the work of suppressing the gypsy and brown-tail moths in such cities and towns as may through the proper officials request it. The cost of such work shall be certified by the superintendent to the treasurer of the commonwealth and shall be

collected by him as an additional state tax upon the city or town wherein such work is performed: *provided*, that no city or town shall be required to pay more for such work than would have been its liability, as defined by section four of this act, — so as to read as follows: — *Section 5.* When, in the opinion of the superintendent, any city or town is not expending a sufficient amount for the abatement of said nuisance, or is not conducting the necessary work in a proper manner, then the superintendent shall, with the advice and consent of the governor, order such city or town to expend such an amount as the superintendent shall deem necessary, and in accordance with such methods as the superintendent, with the consent of the governor, shall prescribe: *provided*, that no city or town where the assessed valuation of real and personal property exceeds six million dollars shall be required to expend, exclusive of any reimbursement received from the commonwealth, during any one full year more than one fifteenth of one per cent. of such valuation, and that no town where the assessed valuation of real and personal property is less than six million dollars shall be required to expend, exclusive of any reimbursement received from the commonwealth, during any one full year more than one twenty-fifth of one per cent. of such valuation. For the purposes of this section the valuation of each previous year shall be used.

Any city or town failing to comply with the directions of the said superintendent in the performance of said work within the date specified by him shall pay a fine of one hundred dollars a day for failure so to do; said fine to be collected by information brought by the attorney-general in the supreme judicial court for Suffolk county.

In case of emergency, or where there is great or immediate danger of the increase or spread of the moths due to the neglect of any city or town to comply with the terms of this act, the superintendent, with the consent of the governor, may initiate or continue the work of suppressing the moths within the limits of such city or town for such a period as the superintendent may deem necessary. The cost of such work, including that done on private estates, less any sum due from the state by way of reimbursements on account of said work, shall be certified by the superintendent to the treasurer of the commonwealth, and be collected by him as an additional state tax upon the city or town so failing to comply with the requirements of the law. The superintendent may also in case of emergency, subject to the approval of the governor, carry on wholly or in part such operations as may be necessary to check the spreading of the gypsy or brown-tail moth in parks not under the control of the commonwealth, and in cemeteries, woodlands and other places of public resort. The amount to be so expended in any one year shall not exceed ten per cent of the appropriations made for the year by the state for the purpose of suppressing said moths.

The superintendent may also take complete control of the work of suppressing the gypsy and brown-tail moths in such cities and towns as

may through the proper officials request it. The cost of such work shall be certified by the superintendent to the treasurer of the commonwealth and shall be collected by him as an additional state tax upon the city or town wherein such work is performed; *provided*, that no city or town shall be required to pay more for such work than would have been its liability, as defined by section four of this act. [Approved May 26, 1911.

FINANCIAL STATEMENTS.

In our financial statement, given below, of the general appropriation for suppressive work, we show a balance of \$47,442.07. This balance will be somewhat reduced by reimbursements to towns and cities which have not yet returned final papers of the year's expenses to this office.

GENERAL APPROPRIATION.

Receipts.

Balance from 1910,	\$19,992 47	
Appropriation for 1911,	150,000 00	
Appropriation of July 6, 1911,	150,000 00	
Cash returned by town of Belmont,	478 11	
Cash returned for error on Lexington pay roll,	4 50	
Transfer from parasite appropriation,	5,439 00	
Transfer from South Shore fund for supplies,	2,544 10	
Transfer from parasite appropriation for supplies,	236 56	
Transfer from North Shore fund for supplies,	19,224 03	
Transfer from reforestation appropriation for supplies,	20 52	
Transfer from forest fire appropriation for supplies,	3 75	
Transfer from Highway Commission for supplies,	259 69	
Rebate from Adams Express Company,	25	
	<hr/>	\$348,202 98

Expenditures.

Office expenses: —		
Salaries of clerks,	\$2,525 43	
Rent of offices,	1,840 00	
Stationery and postage,	978 00	
Printing,	1,117 50	
	<hr/>	
<i>Amounts carried forward,</i>	\$6,460 93	\$348,202 98

<i>Amounts brought forward,</i>	\$6,460 93	\$348,202 98
Experts,	84 25	
Office and laboratory supplies,	1,754 92	
Office and laboratory sundries,	1,401 72	
Educational work,	17 75	
Rent of laboratory,	145 83	
Importation of parasites,	289 50	
Field expenses: —		
Wages of employees,	33,042 20	
Traveling expenses,	11,986 46	
Tools and supplies,	109,052 91	
Special work,	19,500 00	
Rent of supply store,	725 00	
Equipment at shop and store,	196 87	
Sundries, teaming, etc.,	1,271 07	
Reimbursement to towns and cities,	114,831 50	
	<hr/>	300,760 91
Balance on hand Nov. 30, 1911,		<hr/> \$47,442 07

PARASITE APPROPRIATION.

Receipts.

Balance from 1910,	\$3,679 35	
Appropriation of July 6, 1911,	15,000 00	
Cash returned by W. F. Fiske,	600 00	
Cash returned for tools lost,	3 53	
	<hr/>	\$19,282 88

Expenditures.

Wages of employees,	\$10,263 13	
Traveling expenses,	1,944 39	
Rent,	599 00	
Supplies,	2,139 55	
Stationery and postage,	120 71	
Printing,	290 89	
Sundries,	937 83	
Importation of parasites,	2,442 58	
	<hr/>	18,738 06
Balance on hand Nov. 30, 1911,		<hr/> \$544 82

SPECIAL NORTH SHORE FUND.

Receipts.

Balance from 1910,	\$4,923 97	
Deposit by F. W. Rane, State Forester, . . .	17,500 00	
Deposit by Wm. D. Sohler, agent,	17,500 00	
Deposit by city of Beverly,	5,000 00	
Deposit by town of Manchester,	5,000 00	
Deposit by city of Gloucester,	2,500 00	
Cash received for work on private estates, . .	5,233 25	
Cash received for tools lost,	9 35	
Cash returned to fund for accounts undrawn, .	22 50	
		<hr/>
		\$57,689 07

Expenditures.

Wages of employees,	\$33,520 73	
Traveling expenses,	329 78	
Rent,	166 00	
Supplies,	19,414 54	
Stationery and postage,	3 20	
Sundries, including teaming, etc.,	2,842 36	
		<hr/>
		56,276 61
Balance on hand Nov. 30, 1911,		\$1,412 46

SPECIAL SOUTH SHORE FUND.

Receipts.

Deposit by F. W. Rane, State Forester, . . .	\$2,000 00	
Deposit by H. W. Wadleigh, treasurer, . . .	4,000 00	
		<hr/>
		\$6,000 00

Expenditures.

Wages of employees,	\$3,113 50	
Traveling expenses,	107 75	
Supplies,	2,556 53	
Sundries, including teaming, etc.,	114 54	
		<hr/>
		5,892 32
Balance on hand Nov. 30, 1911,		\$107 68

Financial Summary by Towns.

The following table shows the reimbursement paid to cities and towns for the year 1910, the total net expenditure, the required expenditure before receiving reimbursement from the State, the amount of work on private property returned to this office and the amount of reimbursement paid for 1911, and also the required expenditure for 1912.

Towns and cities having an asterisk against amount of reimbursement for 1911 also received supplies from the State supply store as per list printed on page 87.

	1910. Re- imburse- ment.	1911.				1912. Required Expendi- ture.
		Required Expendi- ture.	Total Net Expendi- ture.	Private Work.	Re- imburse- ment.	
Abington,	-	\$1,220 85	-	-	-	\$1,311 93
Acton,	\$1,269 47	882 65	\$1,885 53	\$277 26	\$1,002 88*	915 40
Acushnet,	-	367 72	-	-	-	382 38
Amesbury,	-	2,498 99	2,215 65	1,189 92	-	2,546 82
Andover,	877 77	2,694 88	4,012 42	2,024 23	759 87*	2,873 89
Arlington,	21 81	4,754 91	5,056 32	1,710 49	21 81*	5,000 00
Ashburnham,	-	410 75	228 86	20 50	-*	421 21
Ashby,	-	211 42	443 75	63 00	232_33*	232 92
Ashland,	82 92	500 57	569 70	110 00	69 13*	515 79
Athol,	-	1,857 48	-	-	-	1,967 57
Attleborough,	-	5,000 00	-	-	-	5,000 00
Auburn,	-	523 20	-	-	-	537 60
Avon,	121 93	388 79	455 96	62 45	67 17*	396 94
Ayer,	-	871 30	-	-	-	890 99
Barnstable,	-	2,456 11	-	-	-	3,150 59
Barre,	-	820 20	-	-	-	910 96
Bedford,	2,178 12	553 31	3,009 55	1,936 46	2,464 26*	600 77
Bellingham,	-	362 66	-	-	-	373 67
Belmont,	-	2,606 61	3,325 71	1,343 97	572 26*	2,757 03
Berkley,	-	161 14	-	-	-	162 46
Berlin,	351 27	236 67	1,118 49	330 65	881 82*	239 68
Beverly,	349 19	5,000 00	- ¹	-	-	5,000 00
Billerica,	2,976 80	1,004 35	1,656 10	1,139 49	651 75*	1,025 97
Blackstone,	-	926 16	-	-	-	944 55
Bolton,	574 91	233 44	1,012 13	143 97	237 10*	234 32
Boston,	20,000 00	5,000 00	52,898 97	9,926 77	20,000 00*	5,000 00
Bourne,	-	1,956 15	-	-	-	2,277 02
Boxborough,	1,932 59	106 40	1,512 51	60 14	1,406 11*	114 43
Boxford,	1,996 61	570 00	2,254 58	441 14	1,684 58*	586 74
Boylston,	-	197 51	-	-	-	206 91
Braintree,	-	2,506 35	-	-	-	2,677 95
Brewster,	-	272 62	-	-	-	341 88
Bridgewater,	210 19	1,387 13	1,667 82	321 05	280 69*	1,420 72
Brockton,	-	5,000 00	-	-	-	5,000 00
Brookfield,	-	516 72	-	-	-	546 68
Brookline,	-	5,000 00	-	-	-*	5,000 00
Burlington,	2,419 46	278 15	2,588 40	229 40	2,310 25*	293 94
Cambridge,	-	5,000 00	-	-	-	5,000 00

¹ Full returns not yet made.

	1910. Re- imburse- ment.	1911.				1912. Required Expendi- ture.
		Required Expendi- ture.	Total Net Expendi- ture.	Private Work.	Re- imburse- ment.	
Canton,	\$1,391 86	\$1,816 78	\$2,971 69	\$647 80	\$1,154 91*	\$2,044 39
Carlisle,	2,099 76	190 88	2,564 14	352 37	2,373 26*	193 85
Carver,	988 95	843 90	939 56	213 00	95 66*	808 23
Charlton,	-	536 06	-	-	-*	539 58
Chelmsford,	1,472 62	1,767 98	2,782 72	1,061 12	464 74*	1,688 17
Chelsea,	-	5,000 00	-	-	-	5,000 00
Clinton,	-	3,375 96	2,519 20	-	-	3,522 98
Cohasset,	1,578 28	3,560 69	5,203 40	1,632 00	1,153 29*	3,997 11
Concord,	3,519 62	2,927 71	4,961 94	3,152 89	1,351 23*	3,088 80
Danvers,	1,650 86	2,588 17	5,946 70	2,109 44	2,479 43*	2,644 15
Dedham,	-	5,000 00	-	-	-	5,000 00
Dennis,	-	522 72	-	-	-	516 50
Douglas,	-	509 95	-	-	-	542 80
Dover,	-	2,189 97	3,144 86	640 68	954 89	2,347 82
Dracut,	492 97	988 45	1,866 90	1,221 93	878 45*	990 92
Dudley,	-	512 77	-	-	-	766 99
Dunstable,	1,437 43	142 28	1,021 05	195 36	878 77*	193 81
Duxbury,	485 23	919 36	1,127 39	761 86	208 03*	948 11
East Bridgewater,	387 38	834 95	1,234 58	335 59	399 63*	897 49
Easton,	-	2,307 89	-	-	-	2,395 75
Essex,	1,099 58	473 03	1,323 26	524 00	850 23*	524 64
Everett,	-	5,000 00	-	-	-	5,000 00
Fairhaven,	-	1,335 34	-	-	-	1,509 81
Falmouth,	-	3,500 67	-	-	-	3,604 88
Fitchburg,	-	5,000 00	-	-	-*	5,000 00
Foxborough,	-	965 99	-	-	-	985 74
Framingham,	-	4,785 18	3,555 39	-	-	5,000 00
Franklin,	-	1,575 46	-	-	-	1,731 40
Gardner,	-	3,298 36	-	-	-	3,806 52
Georgetown,	1,977 49	414 86	1,931 31	526 40	1,516 45*	505 10
Gloucester,	1,276 59	5,000 00	8,176 45	2,569 01	675 33*	5,000 00
Grafton,	-	1,095 75	415 55	127 00	-	1,144 11
Great Barrington,	-	-	-	-	-	2,509 28
Greenfield,	-	4,052 15	-	-	-	4,029 76
Groton,	265 03	1,585 36	1,975 48	194 00	390 12*	1,588 66
Groveland,	1,041 84	465 39	1,426 83	313 78	961 44*	487 34
Halifax,	651 34	246 95	678 81	547 10	431 86*	255 53
Hamilton,	807 98	1,605 62	2,890 53	968 50	734 96*	1,728 38

	1910. Re- imburse- ment.	1911.				1912. Required Expendi- ture.
		Required Expendi- ture.	Total Net Expendi- ture.	Private Work.	Re- imburse- ment.	
Hanover,	\$438 81	\$605 78	\$1,365 96	\$499 13	\$760 18*	\$622 22
Hanson,	642 58	502 04	1,054 62	237 92	552 58*	531 87
Harvard,	772 72	545 52	1,579 21	571 44	1,033 69*	630 22
Haverhill,	587 18	5,000 00	5,218 60	1,753 58	108 28*	5,000 00
Hingham,	13 88	3,152 60	2,224 14	2,676 67	—*	3,140 99
Holbrook,	—	590 44	—	—	—	598 23
Holden,	—	658 02	—	—	—	685 23
Holliston,	—	658 07	—	—	—	791 74
Hopedale,	—	2,371 14	—	—	—	1,975 15
Hopkinton,	179 85	623 69	194 75	—	—	655 65
Hubbardston,	—	275 04	—	—	—	277 09
Hudson,	—	1,537 45	1,835 97	431 17	298 52*	1,589 83
Hull,	—	2,807 54	—	—	—	2,788 01
Hyde Park,	—	5,000 00	—	—	—	5,000 00
Ipswich,	854 74	1,914 20	3,407 75	1,009 33	1,493 55*	2,257 54
Kingston,	2,181 65	646 34	1,142 26	438 86	495 92*	747 58
Lakeville,	—	328 37	—	—	—	336 06
Lancaster,	—	1,765 67	—	—	—	1,868 90
Lawrence,	—	5,000 00	4,613 84	1,669 12	—	5,000 00
Leicester,	—	982 62	12 00	—	—	976 07
Lenox,	—	—	—	—	—	3,065 13
Leominster,	—	4,952 29	—	—	—*	5,000 00
Lexington,	3,343 60	3,130 79	6,967 73	1,511 61	2,050 34*	3,182 90
Lincoln,	1,012 27	1,389 57	1,247 69	2,080 05	—*	1,440 09
Littleton,	1,329 31	454 77	1,404 59	227 87	949 82*	459 41
Lowell,	718 86	5,000 00	5,368 29	3,838 15	109 39*	5,000 00
Lunenburg,	352 42	463 73	1,124 77	663 37	661 04*	501 74
Lynn,	—	5,000 00	2,012 98	—	—	5,000 00
Lynnfield,	1,263 28	397 92	2,048 85	253 63	1,650 93*	437 07
Malden,	—	5,000 00	2,979 17	—	—	5,000 00
Manchester,	—	5,000 00	—	—	—	5,000 00
Mansfield,	—	1,711 68	—	—	—	1,797 57
Marblehead,	—	3,514 38	2,347 26	1,918 95	—	3,700 69
Marion,	—	1,993 87	—	—	—	2,187 92
Marlborough,	—	4,169 23	—	—	—	4,139 61
Marshfield,	906 28	782 93	1,570 44	812 30	787 51*	966 60
Mashpee,	545 86	90 51	967 38	97 89	876 87*	94 60
Mattapoisett,	—	677 70	—	—	—	847 83

	1910. Re- imburse- ment.	1911.				1912. Required Expendi- ture.
		Required Expendi- ture.	Total Net Expendi- ture.	Private Work.	Re- imburse- ment.	
Maynard,	-	\$1,573 37	- ¹	-	-*	\$1,593 12
Medfield,	-	639 28	-	-	-	649 45
Medford,	\$2,184 42	5,000 00	\$5,989 89	\$3,788 18	-*	5,000 00
Medway,	-	595 12	288 17	-	-	607 47
Melrose,	-	5,000 00	2,671 24	1,673 60	-	5,000 00
Mendon,	-	280 58	-	-	-	290 36
Merrimac,	672 61	531 01	1,309 09	290 92	\$778 08*	528 80
Methuen,	808 86	2,879 21	3,942 00	3,433 78	59 92*	3,034 46
Middleborough,	155 38	1,857 92	4,034 97	719 55	1,627 05*	1,916 35
Middleton,	1,114 04	327 23	1,274 03	301 29	946 80*	340 18
Milford,	-	3,732 59	-	-	-	3,812 48
Millbury,	-	941 74	-	-	-	1,123 31
Millis,	-	440 95	-	-	-	463 75
Milton,	7 89	5,000 00	3,901 17	11,491 34	-	5,000 00
Nahant,	-	3,290 10	-	-	-	3,543 50
Natick,	-	3,288 64	2,813 70	2,857 92	-*	3,312 66
Needham,	50 83	2,442 13	2,043 51	1,580 55	-*	2,769 37
New Bedford,	-	5,000 00	-	-	-	5,000 00
Newbury,	2,181 83	505 45	2,848 25	582 15	2,342 80*	524 34
Newburyport,	-	5,000 00	-	-	-	5,000 00
Newton,	7,000 01	5,000 00	26,486 88	21,966 05	5,994 96*	5,000 00
Norfolk,	-	349 08	- ¹	-	-	366 28
North Andover,	350 76	1,975 09	2,684 31	600 00	709 22*	2,163 16
North Attleborough,	-	3,092 90	-	-	-	3,591 39
North Reading,	1,830 05	294 56	2,535 07	644 38	2,240 51*	299 56
Northborough,	-	556 54	488 22	56 00	-	557 81
Northbridge,	-	1,837 84	-	-	-	1,958 94
Norton,	-	521 40	-	-	-	555 78
Norwell,	941 52	423 62	793 89	883 98	-*	457 37
Norwood,	-	5,000 00	-	-	-	5,000 00
Orange,	-	1,481 88	-	-	-	1,620 19
Orleans,	-	273 60	-	-	-	607 60
Oxford,	-	786 53	-	-	-	797 74
Palmer,	-	1,745 87	-	-	-	1,887 59
Paxton,	-	135 80	-	-	-	155 27
Peabody,	627 35	4,436 42	4,271 97	715 90	-	4,824 90
Pembroke,	1,134 65	381 62	1,420 81	327 75	1,039 19*	383 29
Pepperell,	1,570 54	901 88	1,980 58	247 61	1,078 70*	923 79

¹ Full returns not yet made.

	1910. Re- imburse- ment.	1911.				1912. Required Expendi- ture.
		Required Expendi- ture.	Total Net Expendi- ture.	Private Work.	Re- imburse- ment.	
Petersham,	-	\$374 33	-	-	-	\$450 91
Phillipston,	-	113 48	-	-	-	116 10
Plainville,	-	328 78	-	-	-	337 82
Plymouth,	-	4,510 32	-	-	-	4,720 83
Plympton,	\$1,552 20	155 05	\$1,401 13	\$218 34	\$1,246 08*	159 28
Princeton,	-	454 15	-	-	-	551 91
Quincy,	-	5,000 00	6,295 50	1,388 39	647 75	5,000 00
Randolph,	-	922 26	751 48	-	-	1,033 22
Raynham,	20 22	309 49	395 99	52 42	86 50*	318 46
Reading,	1,770 96	2,358 75	3,181 49	2,570 90	822 74*	2,537 43
Rehoboth,	-	369 20	-	-	-	372 53
Revere,	-	5,000 00	3,119 19	-	-	5,000 00
Rochester,	95 70	289 38	-	-	-	290 70
Rockland,	-	1,690 45	1,617 47	-	-	1,765 40
Rockport,	534 62	1,370 67	- ¹	-	-*	1,464 25
Rowley,	893 52	367 45	792 51	168 04	424 70*	1,132 50
Royalston,	-	240 82	2 50	-	-	282 17
Rutland,	-	312 49	-	-	-	318 40
Salem,	322 31	5,000 00	- ¹	-	-	5,000 00
Salisbury,	1,257 57	363 15	1,410 06	433 03	1,046 91*	395 21
Sandwich,	139 16	410 53	560 75	108 25	150 22*	463 12
Saugus,	4,143 49	2,204 21	4,701 77	3,012 31	2,497 56*	2,356 02
Scituate,	1,005 05	1,863 08	6,062 75	825 00	4,199 67*	1,972 23
Seekonk,	-	546 07	-	-	-	566 58
Sharon,	-	1,114 01	-	-	-	1,284 47
Sherborn,	228 72	556 54	1,200 22	713 57	643 68*	604 25
Shirley,	107 41	478 45	682 38	63 55	203 93*	491 91
Shrewsbury,	-	697 72	-	-	-	770 21
Somerville,	-	5,000 00	1,307 19	1,983 51	-	5,000 00
Southborough,	251 16	779 71	1,879 82	1,405 47	314 66*	791 73
Spencer,	-	1,414 28	-	-	-	1,412 37
Springfield,	-	5,000 00	-	-	-	5,000 00
Sterling,	-	466 91	1,132 48	114 49	665 57*	478 13
Stockbridge,	-	-	-	-	-	1,659 75
Stoneham,	254 18	2,022 37	2,371 87	1,562 77	349 50*	2,043 71
Stoughton,	-	1,422 00	-	-	-	1,459 62
Stow,	1,140 86	409 87	1,313 78	188 60	903 91*	414 85
Sturbridge,	-	439 63	-	-	-	440 62

¹ Full returns not yet made.

	1910. Re- imburse- ment.	1911.				1912. Required Expendi- ture.
		Required Expendi- ture.	Total Net Expendi- ture.	Private Work.	Re- imburse- ment.	
Sudbury,	\$1,389 07	\$526 98	\$1,897 27	\$708 70	\$1,370 29*	\$531 46
Sutton,	-	527 21	-	-	-	587 32
Swampscott,	397 71	4,475 02	4,757 76	-	-	4,728 81
Swansea,	-	634 85	-	-	-	666 79
Taunton,	-	5,000 00	-	-	-	5,000 00
Templeton,	-	648 87	-	-	-	673 26
Tewksbury,	1,466 72	586 94	1,853 19	817 10	1,266 25*	583 27
Topsfield,	995 45	635 73	1,680 94	293 81	1,045 21*	857 61
Townsend,	567 19	530 33	895 94	339 61	365 61*	528 84
Truro,	-	151 65	-	-	-	157 21
Tyngsborough,	1,837 51	231 92	1,712 39	1,069 11	1,480 47*	254 54
Upton,	-	450 27	-	-	-	456 76
Uxbridge,	-	1,197 32	-	-	-	1,473 26
Wakefield,	1,190 98	3,752 22	3,151 06	2,421 11	-*	4,010 72
Walpole,	-	2,161 03	-	-	-	2,391 00
Waltham,	224 99	5,000 00	8,217 76	4,641 33	1,346 21*	5,000 00
Wareham,	-	2,025 56	-	-	-	2,087 48
Warren,	-	761 50	-	-	-	800 29
Warwick,	-	176 98	-	-	-	179 81
Watertown,	-	5,000 00	-	-	-	5,000 00
Wayland,	1,956 51	1,136 06	2,181 00	1,310 00	1,044 94*	1,152 62
Webster,	-	3,115 91	-	-	-	3,487 02
Wellesley,	249 77	5,000 00	4,580 02	2,224 39	-	5,000 00
Wellfleet,	-	438 36	-	-	-	410 67
Wenham,	592 68	1,027 19	2,605 16	746 43	1,577 97*	999 67
West Boylston,	-	330 82	-	-	-	353 82
West Bridgewater,	315 54	536 87	971 35	229 00	434 48*	561 81
West Newbury,	666 80	429 67	1,558 01	637 15	1,128 34*	425 49
Westborough,	-	1,297 66	-	-	-	1,311 05
Westford,	2,563 93	772 89	2,878 87	383 61	1,555 98*	829 36
Westminster,	-	344 52	499 01	74 74	154 49	352 48
Weston,	1,078 63	2,769 70	5,219 76	3,911 24	1,354 28*	3,112 89
Westwood,	-	1,180 14	-	-	-	1,409 36
Weymouth,	-	3,143 23	2,274 31	1,668 48	-	3,461 62
Whitman,	-	1,997 89	-	-	-	2,172 46
Wilmington,	1,791 09	609 12	2,841 28	736 54	2,232 16*	642 15
Winchendon,	-	1,673 72	-	-	-	1,659 88
Winchester,	-	5,000 00	-	-	-	5,000 00

	1910. Re- imburse- ment.	1911.				1912. Required Expendi- ture.
		Required Expendi- ture.	Total Net Expendi- ture.	Private Work.	Re- imburse- ment.	
Winthrop,	-	\$5,000 00	-	-	-	\$5,000 00
Woburn,	\$3,263 35	4,596 60	\$10,223 09	\$1,108 89	\$3,529 87*	4,624 55
Worcester,	-	5,000 00	-	-	-*	5,000 00
Wrentham,	-	512 36	-	-	-	541 37
Yarmouth,	-	886 01	-	-	-	942 63

SUMMARY OF RECOMMENDATIONS OF THE STATE FORESTER.

Moth Work.

1. That the customary appropriation for moth work, which has been \$315,000 a year for several years, be now curtailed, with a view of gradual elimination of State aid, according to the following gradation: —

1912, \$250,000, a saving of	. . . . .	\$65,000
1913, 200,000, a saving of	. . . . .	115,000
1914, 150,000, a saving of	. . . . .	165,000
1915, 100,000, a saving of	. . . . .	215,000

It is believed by the State Forester that with the present method of supervision and the growing efficiency of the work, together with the fact that the United States government is now taking the responsibility for checking the spread and relieving the State of the expense of the parasite laboratory, we should begin to gradually rest the burden upon the towns and cities themselves.

In making the recommendations we do so with the understanding that the State Forester be given even greater discretionary powers than in the past to deal with cities and towns according to the merits of their respective cases.

When cities or towns have once been assisted by the State so that the work can be maintained at a comparatively small annual expense, the State should then exercise sufficient compulsory supervision not to allow indifferences to again creep in.

The law giving this office the approval of the local moth superintendent has resulted in less changes, except for improved conditions, and a better grasp of the situation on the part of the men themselves.

In order to systematize our efforts and carry out a definite business-like campaign, however, it is believed that the State For-

ester should be given the above amounts by this General Court for the three succeeding years, thus eliminating the annual appropriation, which is often passed so late in the season that the work is greatly impaired. With a curtailment in appropriation each year from that of the previous one, it will be necessary to be as constantly efficient as possible. With this program carried out our expenditures for the next four years will total \$700,000, as compared with \$1,260,000 for the past four years. As \$150,000 has already been appropriated towards this work the additional appropriation asked for this year for the whole period for the next four years is only \$550,000.

The encouraging features of the outlook in this moth work are as follows: —

- (a) Better supervision and methods.
- (b) Improved equipment.
- (c) A more definite State policy.
- (d) Better co-operation with the United States government.
- (e) Local town and city politics largely eliminated, and local moth superintendents held responsible for results.
- (f) Modern forestry methods, proving great factors in successful economic moth suppression.
- (g) Parasites and diseases proving more and more efficient.

General Forestry.

2. That an increased appropriation be made for the general expenses of the State Forester's department, in order to meet the enlarged demands from reforestation and forestry management, and to render assistance in the chestnut bark disease.

3. That the forest fire work, which has been well organized during the past season, be given additional funds for its further perfection.

4. That the "Resolve to provide for an amendment of the Constitution relative to the taxation of wild or forest lands," which passed the last General Court, based upon a special message of Governor Foss, may receive favorable consideration, for the further benefit of forestry in Massachusetts.

• Respectfully submitted,

F. W. RANE,
State Forester.

THE
STATE FORESTER
OF
MASSACHUSETTS.

NINTH ANNUAL REPORT,
1912.

F. W. RANE, STATE FORESTER.



BOSTON:
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
18 POST OFFICE SQUARE.

1913.

A handwritten mark, possibly a stylized 'Y' or '13', is located below the printed year 1913.

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MAY 3 1913

DATE [illegible]

APPROVED BY
THE STATE BOARD OF PUBLICATION.

The Commonwealth of Massachusetts.

To the General Court.

It again becomes my pleasure as well as duty to submit this the ninth annual report of the State Forester, which reviews the work of this department during the year, with recommendations for its future needs.

As the gypsy and brown-tail moth work, which has been under the State Forester now for four years, has so amalgamated into our regular work that it is a division, just as forestry management, forest fire work, etc., instead of dividing the annual report into Parts I. and II., as heretofore, the moth work this year is treated simply under a division heading.

This report is submitted in accordance with the provisions of chapter 409, section 5, Acts of 1904.

Respectfully submitted,

F. W. RANE,
State Forester.

DEC. 14, 1912.

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A plantation of our native white pine at fifty-five years of age growing at Frankfort, Germany. We should have a large acreage like this in Massachusetts in the future. (Dr. M. Nausauer on the left, Oberforester Fleck on the right.) Taken by Massachusetts State Forester last summer.

The Commonwealth of Massachusetts.

NINTH ANNUAL REPORT OF THE STATE FORESTER.

INTRODUCTION.

The year of 1912 closes an extremely active season in the State Forester's department. Forestry work generally has met with enthusiastic support at the hands of our people, and it is a pleasure to serve in a public capacity under such favorable auspices.

We have a natural forest country and should take advantage of such a heritage. The renowned Black Forests of Germany show what can be accomplished by systematic methods, while in this country the State of New York has been farsighted enough to establish a forest preserve, the area of which approximates two-thirds the size of our whole State. I believe it is time that we people of Massachusetts should take steps to secure a forest preserve which might include, for example, the whole beautiful Berkshire country west of the Connecticut River, or our own renowned Cape Cod District. Either of these areas could readily be made into State reserves, and exploited under modern ideas of forestry management similar to the methods now proposed in the Adirondacks. At the present writing, individuals may destroy at their will the forest products, which will take time and great expense to replace. On the other hand, individual effort can accomplish a great deal, as a trip to Lenox and Stockbridge will testify, but of course quicker and greater results would come from State management of such lands. With a progressive policy a Berkshire forest reserve would ultimately outrival anything in Europe, as its location and topography are ideal.

Although good old Cape Cod is a different forestry proposition altogether, nevertheless its thousands of acres of depleted and waste lands were once covered with magnificent forest growth,

and I believe they could be returned through State management, at small expense, to a sylvan condition which would not only be a delight to the people of Massachusetts but prove attractive to many from other States who summer with us. The light soils of the greater part of the Cape far surpass the sandy lands about Darmstadt, Germany, where there are flourishing forests. Our State highways are already proving that such an expenditure of State money pays, and it is believed that State supervision in forestry would prove equally beneficial. Forestry differs even from building State highways, in that forests neither wear out nor necessitate a constant maintenance expense, but, on the contrary, bring interest upon the investment and eventually enhance the principal itself.

On such a question, I believe I know where the various Massachusetts organizations, such as the State Board of Agriculture, the Massachusetts Forestry Association, the State Grange, Federation of Woman's Clubs, Fish and Game Associations, etc., would stand. We could rely upon their whole-hearted assistance.

When visiting the national forest near Brussels and while tramping through the Black Forests of Germany the past summer, I was charmed with their achievement, which appealed to me from both the economic and æsthetic standpoint. It was imperative that, on my return, I should try to enthuse the people of the old Bay State to greater endeavor by showing them what might be accomplished by solving the problem in a practical way.

Our people generally have grown to appreciate the great good that has been accomplished through establishing a State-wide forest fire protective system. With many lookout stations scattered over the whole State, from which vigilant, trained observers detect and report fires in their incipency; with four district forest wardens who patrol their divisions and instruct and confer with the local forest wardens in their territory; with a corps of 300 rural mail carriers who travel 6,000 miles daily, except Sundays, with instruction to report all forest fires; and with improved equipment and better systematized organizations for fighting forest fires and determining their causes, we are launching out upon a new era of future possibilities in forestry in this State. Forest fires must absolutely be eliminated if we are to build a stanch, State-wide forest policy.

What is true of forest fires is equally true, only in another way, as to overcoming our forest insect and disease outbreaks. We have been fighting the gypsy and brown-tail moths for years at great expense, — unwelcome guests, to say the least; but with improved methods and organized effort we were able to reduce the annual appropriation \$65,000 the past season, and will recommend an additional reduction of \$50,000 this year, making the amount asked for this year only \$200,000, as compared with \$315,000 ordinarily expended.

The chestnut bark disease is prevalent in the State, and the State Forester is lending every assistance possible in acquainting owners of chestnut growth with the latest methods of combating it. The national government is assisting us in our work against the chestnut bark disease. In a new country like ours it necessarily takes time to adopt and systematize our work so that it will result in future benefit to our people. Forestry and its future importance to the State is as yet relatively little appreciated, as it takes time to educate people generally to recognize its real value.

It is a pleasure to state that the last year's General Court gave the State Forester's department very generous consideration, and we have been enabled thereby to accomplish the work set forth in the following pages of this report.

The constitutional amendment relative to the taxation of forest lands has become a law, after having been submitted to the vote of the people at the recent election. The vote of the last General Court was practically unanimous, as there was not a dissenting vote in the Senate and scarcely any in the House, thus showing the popularity of the measure. It now remains for the incoming General Court to enact some practical, simple and effective legislation which will be sure to encourage modern forestry throughout the State. The State Forester does not wish it to be understood that he advocates the exemption of forest and waste lands from taxation. He believes that these lands should receive definitely regulated taxation, so that their owners may profitably allow the forest product to stand until mature.

The assistance by the State to towns having a million and a half or less valuation, for the purpose of having some permanent forest fire-fighting equipment, has been readily taken advantage

of this year. The \$5,000 allotted each year was exhausted early in the season, and we have requests already booked for next year.

Surveys and maps have finally been completed of all lands taken over by the State under the reforestation act. These are on file for future use.

The department has more nursery stock on hand than ever before, and a progressive policy has already been started with a view to reforesting all waste or worthless lands belonging to our State institutions. The policy is to furnish the stock for planting, free of charge, provided the institutions meet the expense of labor in setting them out.

The United States government, as was predicted last year, has agreed to take definite control of the problem of the spreading of the gypsy moth; hence hereafter our State work resolves itself down to internal self-preservation in the territory already infested. It behooves us, therefore, from now on to perfect and improve the conditions in our towns and cities. In order to accomplish this it must be self-evident that the man locally in charge must have sufficient training and ability to comprehend modern methods first, and in the second place have the ability to handle labor economically.

The assistance given citizens and institutions in suggesting and demonstrating methods of forest management has been greater than ever. The experiment of substituting runabout automobiles for motor cycles for division men who necessarily are constantly traveling has proved in some instances a great advantage.

There are other phases of the work that might be mentioned here, but they are to be more fully explained under their proper classification in this report.

ORGANIZATION.

As is inevitably the case, there have been a few changes during the year in the personnel of the general staff of assistants, but we are fortunate in having intact the greater part of the same trusted and tried organization.

Mr. L. H. Worthley, who has been connected with this department as assistant in moth work for a number of years, resigned

the fore part of the year to accept a similar position with the entomological division of the United States Department of Agriculture. The promotion was a well-deserved one, and after spending eight months in Europe with Mr. Fiske, the government expert, studying the moths in their native haunts, he is now delegated to the duty of checking their spread from New England to other sections of the country. While the State of Massachusetts in a sense loses his services directly as a State employee, we feel assured that in his new position his services may prove of even greater value to us. Mr. George A. Smith, superintendent of District 1, was promoted to the position of assistant in charge of moth work. Mr. Smith has been connected with the work for a long time, and we are fortunate in having one so well qualified to fill this place.

Mr. R. M. Colley of Harvard University, who had charge of the work of propagating and disseminating the fungous disease of the brown-tail moth, completed his work this fall, and Mr. John Murdoch, Jr., a graduate of the Harvard Forestry School, who has been in the employ of this department during the past year, has been placed in charge.

Mr. F. F. Moon, who was associated with the State Forester as assistant during his connection with the Massachusetts Agricultural College, as professor of forestry, resigned to accept a professorship at Syracuse University. Mr. Clark, formerly of the State College of Pennsylvania, has been elected to succeed Professor Moon.

Mr. Wm. Reiff, a student of the Bussey Institute, who was temporarily engaged to carry on some experimental work on a large scale with the flascherie disease of the gypsy moth, under the general direction of Prof. W. M. Wheeler, resigned on August 1.

The organization of the State Forester's department at present is as follows: —

GENERAL STAFF.

F. W. RANE, B.Agr., M.S.,	.	.	State Forester.
H. O. COOK, M.F.,	.	.	Assistant Forester.
M. C. HUTCHINS,	.	.	State Fire Warden.
GEORGE A. SMITH,	.	.	Assistant, moth work.
R. S. LANGDELL,	.	.	Assistant, reforestation.
H. F. GOULD, M.F.,	.	.	Assistant, forestry management.
W. D. CLARK, M.F.,	.	.	Assistant, Massachusetts Agricultural College.
R. H. COLLEY,	.	.	Assistant, moth disease work.
JOHN MURDOCH, Jr., M.F.,	.	.	Assistant, moth disease work.

CHARLES O. BAILEY, . . .	Secretary.
ELIZABETH HUBBARD, . . .	Clerk, bookkeeper.
CHARLOTTE JACOBS, . . .	Clerk, mail and office.
EMILIE RAU, . . .	Stenographer.
JOSEPHA L. GALLAGHER, . . .	Clerk.
JOHN LANERGAN, . . .	Office boy.

CO-OPERATIVE SCIENTIFIC STAFF.

L. O. HOWARD, Ph.D., . . .	Chief, United States Bureau of Entomology, Washington, D. C., parasites and predaceous insects.
THEOBALD SMITH, Ph.B., M.D., . . .	Professor of Comparative Pathology, Harvard University, diseases of insects.
ROLAND THAXTER, Ph.D., . . .	Professor of Cryptogamic Botany, Harvard University, fungous diseases affecting insects.
W. M. WHEELER, Ph.D., . . .	Professor of Entomology, Harvard University, experimental entomologist.

STAFF, FOREST FIRE PROTECTION.

F. W. RANE, M.S., . . .	State Forester.
M. C. HUTCHINS, . . .	State Fire Warden.
M. E. FENN, . . .	Assistant.
JAMES MOLOY, . . .	District Forest Warden No. 1.
J. J. SHEPHERD, . . .	District Forest Warden No. 2.
JOHN P. CROWE, . . .	District Forest Warden No. 3.
F. L. HAYNES, . . .	District Forest Warden No. 4.

*Observers and Observation Stations.**District 1: —*

WM. BRAY, . . .	Bald Pate Hill, Georgetown.
HENRY FAY, . . .	Hart Hill, Wakefield.
J. FRANK HAMMOND, . . .	Robbins Hill, Chelmsford.
ELLIOT C. HARRINGTON, . . .	Blue Hill, Milton.
ALFRED MACDONALD, . . .	Bluff Head, Sharon.

District 2: —

CALVIN BENSON, . . .	Shoot Flying Hill, Barnstable.
FRANK L. BUCKINGHAM, . . .	Reservoir Hill, Plymouth.
IRVING W. CHACE, . . .	Richmond Hill, Dighton.

District 3: —

J. HARRY ALLEN, . . .	Wachusett Mountain, Princeton.
ALFRED W. DOUBLEDAY, . . .	Lighthouse Hill, Prescott.
W. J. HALLORAN, . . .	Fay Mountain, Westborough.
F. H. LOMBARD, . . .	Grace Mountain, Warwick.
GEO. W. SHERMAN, . . .	Steerage Rock Mountain, Brimfield.

District 4: —

ALBERT E. BAUER, . . .	Greylock Mountain, Adams.
EDWIN F. DESMOND, . . .	Becket Mountain, Becket.
GEO. C. MILLER, . . .	Mount Tom, Easthampton.
NELSON C. WOODWARD, . . .	Massamet Mountain, Shelburne.

STAFF, MOTH WORK.

F. W. RANE, M.S., State Forester.
 GEORGE A. SMITH, Assistant (General Superintendent).
 ENWRIGHT, JOHN W., Superintendent, District 1, 299 Fellsway, Medford.
 PHILLIPS, SAUL, Superintendent, District 2, P. O. Box 266, Beverly.
 WORTHEN, FRANCIS C., Superintendent, District 3, Central Street, Georgetown.
 FITZGERALD, JOHN J., Superintendent, District 4, 50 Howard Street, Haverhill.
 HATCH, WILLIAM A., Superintendent, District 5, 174 Main Street, Hudson.
 RAMSEY, HARRY B., Superintendent, District 6, 27 Lincoln Avenue, Worcester.
 PARKHURST, CLARENCE W., Superintendent, District 7, P. O. Box 472, Medfield.
 HOLMES, WALTER F., Superintendent, District 8, King Street, Cohasset.
 FARLEY, JOHN A., Superintendent, District 9, Plymouth, R. F. D.
 CARLETON, JOHN F., Superintendent, District 10, East Sandwich.

Inspectors.

ARMSTRONG, HENRY F. MERRICK, JOHN L.
 EMERSON, THOMAS. SANDS, GEORGE A.
 SILVA, JOSEPH.

Mechanics.

HALPIN, FREDERICK P. TOWLE, CLAUDE E.
 LEAROYD, FRANCIS V., in charge, Supply Store.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS.

[Alphabetically by towns and cities.]

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
No telephone, .	B. E. Wilkes, ¹	Abington,	C. F. Shaw,	9
No telephone, .	W. H. Kingsley,	Acton,	J. O'Neil,	5
2003-M,	Henry F. Taber,	Acushnet,	A. P. R. Gilmore,	10
48-2,	John Clancy,	Adams,	John Clancy,	6
3165-11,	E. M. Hitchcock,	Agawam,	- -	-
151-32, Great Bar- ringt'n. -	J. H. Wilcox, State Line, James E. Feltham,	Alford, Amesbury,	- - A. L. Stover,	- 3
174-3,	A. F. Bardwell,	Amherst,	W. H. Smith,	6
71-3,	John H. Playdon,	Andover,	J. H. Playdon,	4
35,	Walter H. Pierce, ¹	Arlington,	W. H. Bradley,	1
2-12,	John T. Withington,	Ashburnham,	Chas. H. Pratt,	5
- -	Wm. S. Green,	Ashby,	H. A. Lawrence,	5
4-12,	Chas. A. Hall,	Ashfield,	- -	-
146-L, So. Fram- ingham.	Horace H. Piper,	Ashland,	M. Geoghan,	7
48-J or 72-4, .	Frank P. Hall, ¹	Athol,	W. S. Penniman,	6

¹ Chief of fire department.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
34-4, . . .	Hiram R. Packard, ¹	Attleborough, .	W. E. S. Smith, .	7
5-17, . . .	J. F. Searle, . . .	Auburn, . . .	J. F. Searle, . . .	6
8072-4, . . .	J. W. McCarty, . . .	Avon, . . .	W. W. Beals, . . .	7
96-4 or 477-4, . . .	Chas. E. Perrin, . . .	Ayer, . . .	D. W. Mason, . . .	5
236-2, . . .	Henry C. Bacon, P. O. Hyannis.	Barnstable, . . .	H. C. Bodfish, . . .	10
8-4, . . .	A. E. Traver, . . .	Barre, . . .	G. R. Simonds, . . .	6
3-12, . . .	Elmer D. Ballou, . . .	Becket, . . .	- -	-
No telephone, . . .	Chas. E. Williams, . . .	Bedford, . . .	W. A. Cutler, . . .	1
10, . . .	James A. Peeso, . . .	Belchertown, . . .	E. C. Howard, . . .	6
8157-22, Milford, . . .	L. Francis Thayer, . . .	Bellingham, . . .	H. A. Whitney, . . .	7
409-W, . . .	John F. Leonard, ¹ . . .	Belmont, . . .	C. H. Houlahan, . . .	1
No telephone, . . .	Gideon H. Babbitt, Taun- ton, R. F. D., 1.	Berkley, . . .	J. M. Alexander, . . .	9
14-6, . . .	Walter Cole, . . .	Berlin, . . .	E. C. Ross, . . .	5
2-13, . . .	Edson W. Hale, . . .	Bernardston, . . .	- -	-
168-12, . . .	Robt. H. Grant, ¹ . . .	Beverly, . . .	J. B. Brown, . . .	2
22-2, . . .	E. N. Bartlett, ¹ . . .	Billerica, . . .	W. H. O'Brien, . . .	4
475-L-1, Woon- socket.	Thomas Reilly, . . .	Blackstone, . . .	P. J. Gibbons, . . .	6
10-1, . . .	H. K. Herrick, . . .	Blandford, . . .	- -	-
9-21, . . .	Everett M. Walcott, . . .	Bolton, . . .	C. E. Mace, . . .	5
- -	- -	Boston, . . .	D. H. Sullivan, . . .	-
- -	Emory A. Ellis, Bourne- dale.	Bourne, . . .	Edward D. Nickerson, son.	10
11-4, West Acton, . . .	M. L. Wetherbee, . . .	Boxborough, . . .	C. E. Sherry, . . .	5
- -	Harry L. Cole, George- town, R. F. D.	Boxford, . . .	C. Perley, . . .	3
17-3, . . .	H. J. Shattuck, . . .	Boylston, . . .	R. B. Smith, . . .	6
- -	James M. Cutting, South Braintree.	Braintree, . . .	O. A. Hubbard, . . .	8
No telephone, . . .	T. B. Tubman, . . .	Brewster, . . .	J. E. Eldridge, . . .	10
8-6, . . .	Edwin S. Rhoades, . . .	Bridgewater, . . .	A. W. McFarland, . . .	7
14-3, . . .	Geo. E. Hitchcock, . . .	Brimfield, . . .	G. E. Hitchcock, . . .	6
1041, . . .	Harry L. Marston, ¹ . . .	Brockton, . . .	R. H. Carr, . . .	7
- -	Elbert L. Bemis, . . .	Brookfield, . . .	J. H. Conant, . . .	6
376, . . .	Geo. H. Johnson, ¹ . . .	Brookline, . . .	D. G. Lacy, . . .	-
Lampson & Good- now Mfg. Co.	Wm. Sauer, Shelburne Falls.	Buckland, . . .	- -	-
2-5, . . .	Walter W. Skelton, . . .	Burlington, . . .	W. W. Skelton, . . .	1
21060, . . .	Lawrence Horton, Ponka- pog.	Canton, . . .	A. Hemenway, . . .	7
- -	- -	Cambridge, . . .	J. F. Donnelly, . . .	1
8166, Concord, . . .	Geo. E. Wilkins, . . .	Carlisle, . . .	G. G. Wilkins, . . .	1
16-2, . . .	Herbert F. Atwood, . . .	Carver, . . .	H. F. Atwood, . . .	9

¹ Chief of fire department.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
W. N. Potter & Co.	Fred D. Legate, . . .	Charlemont, . . .	- -	-
32-3, . . .	Carlos Bond, Charlton Depot.	Charlton, . . .	J. D. Fellows, . .	6
11-12, . . .	Geo. W. Ryder, West Chatham.	Chatham, . . .	G. B. Bassett, . .	10
1597-4, Lowell, .	Arnold C. Perham, . .	Chelmsford, . .	M. A. Bean, . . .	4
- -	- -	Chelsea, ² . . .	J. A. O'Brien, . .	1
167-3, . . .	Chas. D. Cummings, .	Cheshire, . . .	- -	-
8-2, . . .	Myron E. Turner, . . .	Chester, . . .	- -	-
8004, . . .	Chas. A. Bisbee, Bisbees,	Chesterfield, . .	- -	-
1492, . . .	John E. Pomphret, ¹ . .	Chicopee, . . .	Z. Pilland, . . .	6
No telephone, .	Ernest C. Mayhew, . .	Chilmark, . . .	A. S. Tilton, . . .	10
- -	Edward Newton, North Adams, R. F. D.	Clarksburg, . . .	- -	-
12-J, . . .	Albert Fairbanks, . . .	Clinton, . . .	John Martin, . . .	5
177-3 or 260, . .	Wm. J. Brennock, . . .	Cohasset, . . .	J. E. Grassie, . . .	8
- -	J. D. Gilchrest, . . .	Colrain, . . .	- -	-
- -	Frank W. Holden, . . .	Concord, . . .	H. P. Richardson, .	5
5-3, . . .	Edgar Jones, . . .	Conway, . . .	- -	-
8001, . . .	W. S. Gabb, . . .	Cummington, . .	- -	-
58-11, . . .	A. K. Cleveland, . . .	Dalton, . . .	- -	-
No telephone, .	Thos. L. Thayer, North Dana.	Dana, . . .	T. L. Thayer, . . .	6
277-3, . . .	Michael H. Barry, . . .	Danvers, . . .	G. E. Lane, . . .	2
1383-41, New Bedford.	S. P. Hawes, . . .	Dartmouth, . . .	E. M. Munson, . .	10
35-R, . . .	H. J. Harrigan, . . .	Dedham, . . .	J. T. Kennedy, . .	7
273-14, Greenfield,	Wm. L. Harris, . . .	Deerfield, . . .	- -	-
No telephone, .	Alpheus P. Baker, South Dennis.	Dennis, . . .	H. H. Sears, . . .	10
29-3, . . .	Ralph Earle, . . .	Dighton, . . .	D. F. Lane, . . .	9
East Douglas, Central.	Wm. L. Church, . . .	Douglas, . . .	T. J. Libby, . . .	6
373-1, . . .	John Breagy, . . .	Dover, . . .	H. L. McKenzie, . .	7
3353-2, . . .	Frank H. Gunther, . . .	Dracut, . . .	T. F. Carrick, . . .	4
152-2, . . .	F. A. Putnam, . . .	Dudley, . . .	I. H. Esterbrook, . .	6
No telephone, .	A. W. Swallow, . . .	Dunstable, . . .	W. H. Savill, . . .	4
22-2, . . .	E. W. Soule, Box 15, Mill- brook.	Duxbury, . . .	H. A. Fish, . . .	9
146-5, . . .	R. H. Copeland, Elm- wood.	E. Bridgewater, . .	Frank H. Taylor, . .	7
4-3, . . .	E. J. Speight, . . .	E. Longmeadow, . .	- -	-
- -	Adin L. Gill, North East- ham.	Eastham, . . .	N. P. Clark, . . .	10
2-11, . . .	J. M. Dineen, . . .	Easthampton, . . .	- -	-
24-7, . . .	John Baldwin, North Easton. ¹	Easton, . . .	R. W. Melendy, . .	7
241-2, . . .	Manuel S. Roberts, . . .	Edgartown, . . .	T. S. Wimpenny, . .	10

¹ Chief of fire department.² No forest area.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
165-14, Gt. Barrington.	F. W. Bradford, Great Barrington.	Egremont, . .	- -	-
1-13, . . .	Harry L. Ryther, . .	Enfield, . .	Clinton Powell, .	6
No telephone, .	Chas. H. Holmes, Farley,	Erving, . .	- -	-
23-5, . . .	Otis O. Story, . . .	Essex, . . .	O. O. Story, . .	2
- -	- -	Everett,² . .	J. Davidson, . .	1
1426-2 or 3493-3, .	Wm. P. Shaw, . . .	Fairhaven, . .	G. W. King, . .	10
- -	James H. Nugent, . .	Fall River, . .	J. H. Nugent, . .	10
136-2, . . .	H. H. Lawrence, Teaticket.	Falmouth, . .	W. B. Bosworth, .	10
1421-W or 745, .	W. W. Colton, . . .	Fitchburg, . .	W. W. Colton, . .	5
Hoosac Tunnel Pay Station.	H. B. Brown, Drury, .	Florida, . .	- -	-
15-5 or 76-5, .	Ernest A. White, ¹ . .	Foxborough, . .	S. J. Johnston, . .	7
352-4 So. Framingham.	B. P. Winch, . . .	Framingham, . .	N. I. Bowditch, .	7
67-3, . . .	E. S. Cook, . . .	Franklin, . .	J. W. Stobbart, .	7
- -	Andrew Hathaway, Assonet.	Freetown, . .	G. M. Nichols, . .	9
191-M, . . .	Geo. S. Hodgman, . .	Gardner, . .	T. W. Danforth, .	6
- -	Leander B. Smalley, Memsha.	Gay Head, . .	J. W. Belain, . .	10
4-2, . . .	Clinton J. Eaton, . .	Georgetown, . .	C. J. Eaton, . .	3
4-15 Bernardston,	Lewis C. Munn, Turners Falls.	Gill, . . .	A. Tuttle, . . .	6
547-5, . . .	Sydney F. Haskell, . .	Gloucester, . .	H. J. Worth, . .	2
18-4, . . .	John S. Mollison, Williamsburg.	Goshen, . .	- -	-
- -	Rodney E. Bennett, Cuttyhunk.	Gosnold, . .	- -	-
Central, . . .	Sumner F. Leonard, . .	Grafton, . .	C. K. Despeau, . .	6
55-4, . . .	C. N. Rust, . . .	Granby, . .	- -	-
4-12, . . .	Lawrence F. Henry, . .	Granville, . .	- -	-
5-3, . . .	Daniel W. Flynn, . .	Gt. Barrington, . .	T. J. Kearin, . .	6
443-M, . . .	J. W. Bragg, . . .	Greenfield, . .	J. W. Bragg, . .	6
33-24, . . .	Wm. H. Walker, Greenwich Village.	Greenwich, . .	B. A. Sawtelle, .	6
105, . . .	J. B. Harrington, . .	Groton, . .	J. F. Bateman, . .	4
1026-X, . . .	Sidney E. Johnson, . .	Groveland, . .	R. B. Larive, . .	3
651-33, . . .	Edward P. West, . .	Hadley, . .	- -	-
5-3, Bryantville, .	Jared B. Baker, . .	Halifax, . .	F. D. Lyons, . .	9
No telephone, .	Fred Berry, Essex, R. F. D.	Hamilton, . .	E. G. Brewer, . .	2
- -	Walter S. Beebe, . .	Hampden, . .	- -	-
Post office, . .	Chas. F. Tucker, . .	Hancock, . .	- -	-
8011-2, . . .	Chas. E. Damon, North Hanover.	Hanover, . .	L. Russell, . .	9
8012-6, Bryantville,	Albert L. Dame, South Hanover.	Hanson, . .	A. L. Dame, . .	9
No telephone, .	P. J. Humphrey, . .	Hardwick, . .	P. J. Humphrey, .	6

¹ Chief of fire department.² No forest area.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
46-3, . . .	Benj. J. Priest, . . .	Harvard, . . .	G. C. Maynard, . .	5
Central, . . .	John Condon, . . .	Harwich, . . .	Arthur F. Cahoon, .	10
6-3, . . .	John M. Strong, West Hatfield.	Hatfield, . . .	John M. Strong, . .	6
4-2, . . .	John B. Gordon, . . .	Haverhill, . . .	M. Fitzgerald, . .	4
121-3, . . .	Melvin H. White, Charle- mont.	Hawley, . . .	- -	-
5-18, . . .	S. G. Benson, . . .	Heath, . . .	- -	-
21305, . . .	Geo. Cushing, ¹ . . .	Hingham, . . .	T. L. Murphy, . .	8
- -	E. H. Goodrich, . . .	Hinsdale, . . .	- -	-
150, Randolph, .	E. W. Austin, ¹ . . .	Holbrook, . . .	F. T. White, . .	7
29-4, . . .	Winfred H. Stearns, Jeffer- son.	Holden, . . .	W. H. Stearns, . .	6
5-21, . . .	Oliver L. Howlett, South- bridge, R. F. D.	Holland, . . .	A. F. Blodgett, . .	6
1-2, . . .	W. A. Collins, . . .	Holliston, . . .	Herbert E. Jones, .	7
R. H. Dietz, .	Cornelius J. Haley, . .	Holyoke, . . .	- -	-
233-2, . . .	Walter F. Durgin, . . .	Hopedale, . . .	W. F. Durgin, . .	6
Central, . . .	R. I. Frail, . . .	Hopkinton, . . .	W. A. Macmillan, .	6
25-13, . . .	E. A. Young, . . .	Hubbardston, . .	E. A. Young, . .	6
207-M, . . .	Wm. L. Wolcott, ¹ . . .	Hudson, . . .	F. P. Hosmer, . .	5
248-W, . . .	Smith F. Sturges, Aller- ton.	Hull, . . .	J. Knowles, . .	8
- -	Fred P. Stanton, . . .	Huntington, . . .	- -	-
42-6 or 100, . .	A. J. Barton, . . .	Ipswich, . . .	J. Morey, . . .	3
- -	Arthur B. Holmes, . . .	Kingston, . . .	R. F. Randall, . .	9
261-2, . . .	Nathan F. Washburn, . .	Lakeville, . . .	N. F. Washburn, .	10
218-13, . . .	Arthur W. Blood, . . .	Lancaster, . . .	L. R. Griswold, . .	5
717-5, Pittsfield, .	King D. Keeler, . . .	Lanesborough, . .	- -	-
90, . . .	Dennis E. Carey, . . .	Lawrence, . . .	I. B. Kelly, . . .	4
66-5, . . .	James W. Bossidy, . . .	Lee, . . .	- -	-
No telephone, .	Chas. White, Cherry Val- ley.	Leicester, . . .	J. H. Woodhead, . .	6
135, . . .	O. R. Hutchinson, . . .	Lenox, . . .	M. O'Brien, . . .	6
546 or 9, . . .	Fred A. Russell, . . .	Leominster, . . .	D. E. Bassett, . .	5
9-44, Cooleyville, .	O. C. Marvel, North Lev- erett.	Leverett, . . .	- -	-
No telephone, .	Azor P. Howe, . . .	Lexington, . . .	A. P. Howe, . . .	1
248-11, . . .	Jacob Sauter, . . .	Leyden, . . .	- -	-
56-5, . . .	J. J. Kelliher, Concord, R. F. D.	Lincoln, . . .	J. J. Kelliher, . .	5
17-4, . . .	A. E. Hopkins, . . .	Littleton, . . .	A. E. Hopkins, . .	5
1233-2, . . .	Oscar C. Pomeroy, . . .	Longmeadow, . . .	- -	-
201-21, . . .	E. S. Hosmer, ¹ . . .	Lowell, . . .	C. A. Whittet, . .	4
17-13, . . .	Edward E. Chapman, . .	Ludlow, . . .	- -	-

¹ Chief of fire department.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
20, . . .	James S. Gilchrest, . .	Lunenburg, . .	James S. Gilchrest, . .	5
1174, . . .	Herbert C. Bayrd, . .	Lynn, . . .	G. H. McPhetres, . .	2
No telephone, .	Thos. E. Cox, Wakefield, .	Lynnfield, . .	L. H. Twiss, . .	1
- -	R. F. D. M. F. Enwright, . .	Malden, . . .	W. B. Gould, . .	1
283-2, . . .	John D. Morrison, . .	Manchester, . .	J. D. Morrison, . .	2
1-2, . . .	Herbert E. King, ¹ . .	Mansfield, . .	Marvin J. Hills, . .	7
No telephone, .	John T. Adams, . .	Marblehead, . .	W. H. Stevens, . .	2
117-2, . . .	Geo. B. Nye, . . .	Marion, . . .	J. Allanack, . .	10
345-2, . . .	E. C. Minehan, ¹ . .	Marlborough, . .	M. E. Lyons, . .	5
43-3, . . .	Wm. G. Ford, . . .	Marshfield, . .	P. R. Livermore, . .	9
19-11 or 19-4, Co- tuit.	Joseph A. Peters, . .	Mashpee, . . .	W. F. Hammond, . .	10
25-2, . . .	E. C. Stetson, . . .	Mattapoisett, . .	A. H. Dexter, . .	10
123-11, . . .	G. A. Gutteridge, . .	Maynard, . . .	A. Coughlan, . .	5
106-4, . . .	W. E. Kingsbury, ¹ . .	Medfield, . . .	G. L. L. Allen, . .	7
138 or 53, . . .	Chas. E. Bacon, . . .	Medford, . . .	W. J. Gannon, . .	-
15-2 or 38-3, . .	Clyde C. Hunt, ¹ . .	Medway, . . .	F. Hager, . . .	7
- -	- -	Melrose, . . .	J. J. McCullough, . .	1
156-6, . . .	Frank M. Aldrich, . .	Mendon, . . .	F. M. Aldrich, . .	6
21-3, . . .	Edgar P. Sargent, . .	Merrimac, . . .	C. R. Ford, . . .	3
No telephone, .	Herbert Nichols, . .	Methuen, . . .	A. H. Wagland, . .	4
5 or 36, . . .	Chester E. Weston, . .	Middleborough, . .	A. D. Nelson, . .	9
9024-14, . . .	Thos. H. Fleming, Ban- croft.	Middlefield, . .	- -	-
- -	Chas. O. Currier, . .	Middleton, . .	B. T. McGlauffin, . .	3
65-3, . . .	E. M. Crockett, . . .	Milford, . . .	P. F. Fitzgerald, . .	6
- -	Harry L. Snelling, . .	Millbury, . . .	E. F. Roach, . .	6
5-2, . . .	Chas. La Croix, . . .	Millis, . . .	E. W. Stafford, . .	7
322, . . .	N. T. Kidder, . . .	Milton, . . .	N. T. Kidder, . .	8
No telephone, .	S. R. Tower, . . .	Monroe, . . .	- -	-
12-22, . . .	O. E. Bradway, . . .	Monson, . . .	- -	-
278-15, Greenfield,	Fred T. Lyman, . . .	Montague, . . .	Dennis J. Shea, . .	6
Post office, . .	D. C. Tyron, . . .	Monterey, . . .	- -	-
3-24, Russell, .	Andrew J. Hall, . . .	Montgomery, . .	- -	-
No telephone, .	G. W. Patterson, . .	Mt. Washington, .	- -	-
138, . . .	Thos. Roland, . . .	Nahant, ² . . .	T. Roland, . . .	2
16-21, . . .	Geo. M. Winslow, . .	Nantucket, . .	G. M. Winslow, . .	10
31, . . .	B. E. Darling, . . .	Natick, . . .	H. S. Hunnewell, . .	7
195-1, . . .	Howard H. Upham, ¹ . .	Needham, . . .	E. E. Riley, . . .	7

¹ Chief of fire department.² No forest area.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
No telephone, .	Chas. S. Baker, . .	New Ashford, .	- -	-
2280, . . .	Edward F. Dahill, ¹ .	New Bedford, .	C. F. Lawton, .	10
31-15, North Brookfield.	E. L. Havens, . . .	New Braintree, .	E. L. Havens, .	6
- -	Henry P. Stanton, . .	N. Marlborough,	- -	-
Pay station, .	Rawson King, Cooley- ville.	New Salem, .	R. King, . . .	6
173-1, Newbury- port.	Wm. P. Bailey, Byfield, .	Newbury, . . .	H. L. Bailey, .	3
380, . . .	Chas. P. Kelley, . . .	Newburyport, .	C. P. Kelley, .	3
N. W., 33-1, .	W. B. Randlett, ¹ Newton Center.	Newton, . . .	C. I. Buckman, .	1
41-5, . . .	Jas. T. Buckley, . . .	Norfolk, . . .	James T. Buckley,	7
205-4, . . .	H. J. Montgomery, ¹ .	North Adams, .	H. E. Blake, .	6
821-3, . . .	Geo. A. Rea, . . .	North Andover, .	Joseph W. Crockett,	4
17-3 or 209, .	Preston D. White, . .	N. Attleborough,	F. P. Toner, . .	7
26-14, . . .	Geo. O. Rollins, ¹ . .	N. Brookfield, .	S. D. Colburn, .	6
33-3, . . .	Henry Upton, ¹ . . .	North Reading, .	G. E. Eaton, .	1
165, . . .	F. E. Chase, . . .	Northampton, .	Christopher Clarke,	6
14-5, . . .	T. P. Haskell, . . .	Northborough, .	T. P. Haskell, .	6
71-5, Whitinsville,	W. E. Burnap, Whitins- ville.	Northbridge, .	A. F. Whitin, .	6
2-3, . . .	Fred W. Doane, . . .	Northfield, . .	F. W. Doane, .	6
29-11, . . .	Geo. H. Storer, . . .	Norton, . . .	G. H. Storer, .	7
11-4, . . .	John Whalen, . . .	Norwell, . . .	J. H. Sparrell, .	9
55-4, . . .	Frank W. Talbot, . .	Norwood, . . .	Ebin F. Gay, .	7
- -	Frank W. Chase, . . .	Oak Bluffs, . .	P. P. Hurley, .	10
17-5, . . .	C. H. Trowbridge, . .	Oakham, . . .	C. H. Trowbridge,	6
67-13, . . .	F. M. Jennison, . . .	Orange, . . .	F. M. Jennison, .	6
21-12, . . .	Chas. F. Poor, . . .	Orleans, . . .	A. Smith, . . .	10
- -	Durand A. Witter, . .	Otis, . . .	- -	-
9-5, . . .	Olin D. Vickers, . . .	Oxford, . . .	C. G. Larned, .	6
65-11 or 53-3, .	James Summers, ¹ . .	Palmer, . . .	C. H. Keith, .	6
- -	Fred L. Durgin, . . .	Paxton, . . .	F. L. Durgin, .	6
18-3, . . .	M. V. McCarthy, . . .	Peabody, . . .	J. F. Callahan, .	1
- -	Myron N. Allen, . . .	Pelham, . . .	- -	-
7-23, Bryantville,	Jos. J. Shepard, . . .	Pembroke, . . .	J. J. McFarlen, .	9
54-3 or 12-5, .	Geo. G. Tarbell, . . .	Pepperell, . . .	J. Tune, . . .	4
- -	Walter H. Pike, . . .	Peru, . . .	- -	-
13-2, . . .	Geo. P. Marsh, . . .	Petersham, . .	David Broderick,	6
176-6, Athol, .	W. H. Cowlbeck, Athol, R. F. D., 3.	Phillipston, . .	W. H. Cowlbeck, .	6
149 or 964, . .	Wm. C. Shepard, ¹ . .	Pittsfield, . . .	- -	-

¹ Chief of fire department.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
18-31, Cumming- ton Exchange.	E. L. Parker, . . .	Plainfield, . . .	- -	-
- -	R. P. Rhodes, . . .	Plainville, . . .	C. N. Snell, . . .	7
197-W or 88-4, .	Herbert Morissey, . . .	Plymouth, . . .	A. A. Raymond, . .	9
11-14, Kingston, .	T. W. Blanchard, . . .	Plympton, . . .	D. Bricknell, . . .	9
19-4, . . .	A. W. Doubleday, . . .	Prescott, . . .	C. M. Pierce, . . .	6
13-4, . . .	Fred W. Bryant, . . .	Princeton, . . .	F. A. Skinner, . . .	6
- -	- -	Provincetown, . .	J. M. Burch, . . .	10
- -	A. L. Litchfield, . . .	Quincy, . . .	A. J. Stewart, . . .	8
86-W, . . .	Chas. A. Wales, . . .	Randolph, . . .	C. F. Blanche, . . .	7
1284-R, . . .	John V. Festing, . . .	Raynham, . . .	G. M. Leach, . . .	9
- -	H. E. McIntire, . . .	Reading, . . .	H. M. Donegan, . .	1
11-12, . . .	Benj. F. Monroe, Attle- borough, R. F. D.	Rehoboth, . . .	S. W. Robinson, . .	9
- -	- -	Revere, ² . . .	G. P. Babson, . . .	1
4-2, . . .	T. B. Salmon, . . .	Richmond, . . .	- -	-
No telephone, .	D. E. Hartley, Mattapo- sett, R. F. D.	Rochester, . . .	G. W. Wilcox, . . .	10
55-4, . . .	John H. Burke, . . .	Rockland, . . .	F. H. Shaw, . . .	9
27-3, . . .	A. J. McFarland, . . .	Rockport, . . .	F. A. Babcock, . .	2
21-6, . . .	Merritt A. Peck, Zoar, .	Rowe, . . .	- -	-
No telephone, .	Daniel O'Brien, . . .	Rowley, . . .	L. R. Bishop, . . .	3
279-2, Athol, . .	L. G. Forbes, . . .	Royalston, . . .	A. H. Brown, . . .	6
194, Springfield, .	S. S. Shurtleff, . . .	Russell, . . .	- -	-
13-3, . . .	Henry Converse, . . .	Rutland, . . .	H. E. Wheeler, . .	6
- -	- -	Salem, ² . . .	A. Stillman, . . .	2
- -	James Pike, . . .	Salisbury, . . .	H. C. Rich, . . .	3
Post office, . .	Lyman H. Clark, New Boston.	Sandisfield, . . .	- -	-
52-14, . . .	John F. Carlton, . . .	Sandwich, . . .	B. F. Denison, . .	10
115-3, . . .	Chas. L. Davis, . . .	Saugus, . . .	T. E. Berrett, . . .	1
3-3, . . .	H. H. Fitzroy, . . .	Savoy, . . .	- -	-
- -	Henry T. Cole, ¹ . . .	Scituate, . . .	P. S. Brown, . . .	8
399-L-5, P a w - tucket.	John L. Baker, . . .	Seekonk, . . .	H. L. Thompson, .	9
121-2, . . .	A. A. Carpenter, . . .	Sharon, . . .	J. J. Geissler, . .	7
24-2, . . .	Arthur H. Tuttle, . . .	Sheffield, . . .	- -	-
135-4, . . .	H. O. Fiske, Shelburne Falls.	Shelburne, . . .	- -	-
11-4, Natick, . .	Milo F. Campbell, South Sherborn.	Sherborn, . . .	J. P. Dowse, . . .	7
- -	A. A. Adams, . . .	Shirley, . . .	A. A. Adams, . . .	5
- -	Edward A. Logan, . . .	Shrewsbury, . . .	C. R. Webb, . . .	8

¹ Chief of fire department.² No forest area.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
2-14, . . .	N. J. Hunting, . . .	Shutesbury, . . .	- -	-
- -	Wm. F. Griffiths, Swansea,	Somerset, . . .	C. Riley, . . .	9
- -	R. F. D. -	Somerville, ² . . .	A. B. Pritchard, . .	1
724-1, Holyoke, .	Lewis H. Lamb, South	South Hadley, . .	- -	-
153-2, . . .	Hadley Falls.	Southampton, . .	- -	-
13, Marlborough,	Dana Howland, . . .	Southborough, . .	H. Burnett, . . .	6
11, . . .	Harry Burnett, . . .	Southbridge, . . .	A. Langevin, . . .	6
- -	Aimee Langevin, . . .	Southwick, . . .	- -	-
77-4, . . .	Benj. M. Hastings, . .	Spencer, . . .	G. Ramer, . . .	6
20, Indian Or-	A. F. Howlett, . . .	Springfield, . . .	W. F. Gale, . . .	6
chard.	T. J. Clifford, Indian Or-	Sterling, . . .	J. H. Kilburn, . . .	5
16-2, . . .	chard.	Stockbridge, . . .	Dr. H. C. Haven, . .	6
Post office, . . .	G. F. Herbert, Pratts	Stoneham, . . .	G. M. Jefts, . . .	1
207-R, . . .	Junction.	Stoughton, . . .	W. P. Kennedy, . . .	7
121-3, . . .	Geo. Schneyer, Glendale,	Stow, . . .	G. A. Patterson, . .	5
145-R, Hudson, .	Louis F. Bruce, . . .	Sturbridge, . . .	C. M. Clark, . . .	6
3-16, . . .	James Curley, . . .	Sudbury, . . .	W. E. Baldwin, . . .	5
5-5, . . .	W. H. Parker, Gleason-	Sunderland, . . .	- -	-
46, . . .	dale.	Sutton, . . .	J. E. Gifford, . . .	6
49-16, . . .	Chas. M. Clark, Fiskdale,	Swampscott, . . .	E. P. Mudge, . . .	2
3106-3, . . .	S. W. Hall, South Sud-	Swansea, . . .	A. E. Arnold, . . .	9
- -	bury.	Taunton, . . .	L. W. Hodgkins, . .	9
320 or 1-3, . . .	A. C. Warner, . . .	Templeton, . . .	J. B. Wheeler, . . .	6
23-3, . . .	R. H. Richardson, . . .	Tewksbury, . . .	H. M. Briggs, . . .	4
12-2, . . .	Geo. P. Cahoon, ¹ . . .	Tisbury, . . .	H. W. McLellan, . .	10
102-3, . . .	Thos. L. Mason, . . .	Tolland, . . .	- -	-
- -	Fred A. Leonard, ¹ . . .	Topsfield, . . .	C. W. Floyd, . . .	3
Central, . . .	A. R. Paine, Baldwinsville,	Townsend, . . .	G. E. King, . . .	4
11-2 or 37-2, . .	Harris M. Briggs, . . .	Truro, . . .	J. H. Atwood, . . .	10
No telephone,	E. C. Chadwick, Vineyard	Tyngsborough, . .	C. J. Allgrove, . . .	4
6-4, . . .	Haven.	Tyringham, . . .	- -	-
1-22, Lee, . . .	Clayton H. Deming, . .	Upton, . . .	G. H. Evans, . . .	6
7-2, . . .	Chas. W. Floyd, . . .	Uxbridge, . . .	L. F. Rawson, . . .	6
31-12, . . .	F. J. Piper, ¹ . . .	Wakefield, . . .	W. W. Whittredge, .	1
455-M or 58, . .	Naylor Hatch, . . .	Wales, . . .	M. C. Royce, . . .	6
No telephone, .	Otis L. Wright, . . .	Walpole, . . .	P. R. Allen, . . .	7
112-2, . . .	Geo. F. Knapp, . . .			
	E. M. Baker, ¹ . . .			
	Lewis F. Rawson, . . .			
	Wm. E. Cade, ¹ . . .			
	Warren W. Eager, . . .			
	Horace A. Spear, Jr., .			

¹ Chief of fire department.² No forest area.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
Post office, . .	Geo. L. Johnson, . .	Waltham, . .	W. M. Ryan, . .	1
5-13,	L. A. Charbonneau, . .	Ware,	F. Zeissig,	6
45-23,	Delbert C. Keyes, South Wareham.	Wareham, . .	J. J. Walsh,	10
No telephone, .	Jos. D. Vigneaux, West Warren.	Warren,	A. A. Warriner, . .	6
73-3,	Chas. A. Williams, . .	Warwick,	G. D. Sheperdson, .	6
- -	Lester Heath,	Washington, . .	- -	-
116, Newton North.	John C. Ford,	Watertown, . .	J. C. Ford,	1
56-4, Natick, .	C. S. Williams, Cochitu- ate.	Wayland,	D. J. Graham, . . .	5
113-4,	Timothy Toomey, . . .	Webster,	C. Klebart,	6
126-9,	Richard F. Evans, ¹ . .	Wellesley, . . .	F. M. Abbott, . . .	7
- -	John Holbrook,	Wellfleet, . . .	E. S. Jacobs,	10
- -	Geo. J. Newhall, . . .	Wendell,	G. E. Mills,	6
74-2,	Jacob D. Barnes, . . .	Wenham,	J. D. Barnes,	2
3-21,	Fred E. Clark,	West Boylston, .	C. H. Baldwin, . . .	6
768,	W. P. Laughton, . . .	W. Bridgewater, .	O. Belmore,	7
No telephone, .	J. H. Webb,	W. Brookfield, .	J. H. Webb,	6
5-4,	Moses Smith,	W. Newbury, . .	Frank D. Bailey, . .	3
691-12,	A. A. Sibley,	W. Springfield, .	- -	6
- -	Geo. B. Latour,	W. Stockbridge, .	- , -	-
203-23,	Wm. J. Rotch,	West Tisbury, .	H. W. Athearn, . .	10
No telephone, .	J. H. McDonald, ¹ . . .	Westborough, . .	Wm. Halloran, Jr., .	6
111-Y,	T. H. Mahoney, ¹ . . .	Westfield,	- -	-
14-3,	John A. Healey, Granite- ville.	Westford,	H. L. Nesmith, . . .	4
- -	C. A. Bartlett,	Westhampton, . .	- -	-
15-22,	John C. Goodridge, . .	Westminster, . .	S. Whitney,	6
255-2, Waltham, .	Edward P. Ripley, . . .	Weston,	E. P. Ripley,	5
No telephone, .	Herbert A. Sanford, North Westport.	Westport,	H. A. Sanford, . . .	10
336, West Dedham,	Percy R. Dean, Islington,	Westwood,	C. H. Southerland, .	7
- -	Edgar S. Wright, South Weymouth.	Weymouth, . . .	C. L. Merritt,	8
69-2, South Deer- field.	James A. Wood, East Whately.	Whately,	- -	-
28-14,	C. A. Randall,	Whitman,	C. A. Randall, . . .	9
1-4,	Henry I. Edson, North Wilbraham.	Wilbraham, . . .	H. Starr,	6
37-21,	Fred J. Vining, Hayden- ville.	Williamsburg, . .	- -	-
- -	William Davies,	Williamstown, . .	- -	-
34-4,	Howard M. Horton, . .	Wilmington, . .	O. McGrane,	1
29,	Arlon D. Bailey, . . .	Winchendon, . .	G. W. Drury,	6

¹ Chief of fire department.

LIST OF FOREST WARDENS AND LOCAL MOTH SUPERINTENDENTS — *Con.*

TELEPHONE NUMBER.	Forest Warden.	Town or City.	Local Moth Superintendent.	Div. No.
123-2, . . .	David H. DeCourcy, ¹ .	Winchester, .	S. S. Symmes, .	1
203-12, Dalton, .	Chas. D. Galusha, .	Windsor, . .	- -	-
- -	- -	Winthrop, ² .	J. A. Barry, .	1
110, . . .	Frank E. Tracy, ¹ .	Woburn, . .	J. H. Kelley, .	1
1947-W, . .	Arthur V. Parker, .	Worcester, .	H. J. Neale, .	6
- -	Chas. Kilbourn, .	Worthington, .	- -	-
21-3, . . .	D. Stanley Stone, .	Wrentham, .	W. Gilmore, .	7
- -	Jos. W. Hamblin, .	Yarmouth, .	C. R. Bassett, .	10

¹ Chief of fire department.² No forest area.

TRIP TO EUROPE.

The State Forester was sent as a delegate to attend the meeting of the Second International Entomological Congress, which convened, at Oxford, Eng., August 4 to 10, and to the Black Forest of Germany to study forestry conditions. The entire trip of six weeks was not only of great interest, but it is hoped it will prove of value in the State work. At Oxford there was an assembly of entomologists from all over the world, fourteen from America. The meetings were held in the old historic University buildings of Oxford, and the deliberations were of a very high order and participated in in three languages, namely, English, French and German. Specialists were present who knew insect life of every phase, species and country, and it was an exceptional opportunity to exchange ideas and secure new information. The work of the suppression of the gypsy and brown-tail moths in Massachusetts I found was familiar to all, and in fact Massachusetts, its undertakings and accomplishments in its insect warfare, was frequently alluded to by various delegates as meriting the congratulations of all countries of the world. In talking with the delegates from other nations, and especially with those who had observed the habits of these insects in countries other than their own, it was interesting to compare their observations with our own. Instinctively, when in England, I found myself looking the trees over for the accustomed insect life, but without avail.

In talking with Dr. T. Algernon Chapman, an English entomologist, I was informed that, in his desire to propagate the gypsy moth in order to have plenty of specimens, he had actually imported them into England, and had endeavored to establish them on fruit trees at different times, but his undertakings had been a complete failure. In talking with Oberforester Fleck of Frankfort, Ger., I found that, while the gypsy moth was a harmful insect, nevertheless it appeared in sufficient numbers to be destructive only once in ten or twelve years, and even then the outbreak was nothing like that of our American infestation. One of the delegates reported that he had seen the gypsy moth in large numbers in northern Africa, where it had defoliated vegetation in a way similar to that in Massachusetts. Many others gave their experiences from observations, but, on the whole, they revealed nothing in addition to the facts given by Mr. W. F. Fiske and Dr. L. O. Howard, who have made a study personally of European and Japanese conditions, through the co-operative work on the part of Massachusetts and the United States Department of Agriculture.

From observations during my very brief stay in England, and from discussions with entomologists, I was particularly impressed with the fact that insect life generally never seems to reach the extremes there that it does in this country. This is true, I should say, not only in regard to insects affecting trees, but about those preying upon flowers and vegetables as well. It would seem to the writer that climatic conditions are largely responsible for this, for with such frequent precipitation vegetation is kept fresh and healthy, and at the same time insect life generally does not find the variety of conditions to favor its development which our climate, of greater extremes of heat and drought, assists. It may be that parasites are present and aid in keeping the balance, but it is believed that natural climatic conditions are great factors.

On the continent, conditions vary more or less from those of England, and outbreaks here seem to be more frequent and approach much nearer those in America; but even here the past season was comparatively cold and rainy, and therefore not as favorable to the development of insect life. I was, in fact, almost disappointed in not being able to find more forest insect depre-



A well-wooded mountainside of spruce in the Black Forest, Germany. These trees were all planted by the government and yield splendid returns.



A scene in the Black Forest, Germany, showing planted trees of all ages.

dations in the various countries than I did. I was interested in observing that while forest insects seem scarce, fruit insects and diseases seem relatively more numerous and destructive.

One thing that impressed the writer from a forestry standpoint was the definite system of management that prevailed, particularly in Belgium and Germany. With these countries their forestry is so reduced to definite rotations of tree crops, with comparatively few species, that the problem is a simple one. Our forestry conditions in Massachusetts, with the great variety of species, to say nothing of the varying ages and quality of the products, become conglomerate, showing a woeful lack of system in comparison. When we think of the Black Forest of Germany, we at once rightly associate it with spruce and fir, in the growing of which a great many depredations are eliminated, as neither the gypsy nor the brown-tail moth has to be considered, as neither attacks them. The beech forests, again, are quite another type, and hence their management, depredations, etc., require different treatment. In America it behooves us to establish similar policies, and thereby reduce silvicultural endeavors to systems that in themselves can be more easily and simply understood and handled.

In Belgium, the large national forest practically surrounding the city of Brussels was visited, and some time was spent in looking over the government's arboretum and nurseries, where most of our American species of trees are growing. It was like meeting old friends. Some of them seemed happy, while others were apparently more or less homesick.

In Switzerland my time was too short to make any extended trips, but in passing, a compliment should be given the Swiss foresters for the splendid results they have accomplished under many adverse conditions.

In Germany, several tramps were taken into the forest, sections of which were teeming with material for valuable observations and experiences. At Neustadt, Oberforester Wilder showed me every attention possible, and particularly emphasized his troubles as well as his successes. I was enabled here to see every phase of forestry work, from planting and nursery work through to the finished milled product. At Frankfort, Oberforester Fleck and Dr. M. Nassauer were particularly kind in showing me the forests

in that section, which are magnificent and alone worth the whole trip. A white pine stand fifty-five years of age was a splendid sight. (See frontispiece.) Trees of all ages and sizes can be seen here, and the experiments and results are very significant. At Darmstadt, the planting of sandy lands particularly was very interesting. Many other places were visited, each of which proved of more or less interest from a forestry standpoint, as to management, insect depredations, taxation, fire, etc., but it is my purpose to give a brief sketch of the trip at this time; other observations and notes taken at the time will be brought out later. No forester who is interested in his profession can go to the old world without securing a great fund of valuable suggestions and information that may prove of great profit to him in his life's work.

BETTER FORESTRY THE SOLUTION OF THE MOTH PROBLEM.

It may be recalled that the State Forester, upon assuming charge of the moth work, wrote a brief article for that year's annual report (1909, page 100) entitled "Modern Forestry and Insect Warfare." The purpose of calling attention to the same now, three years later, is to emphasize, with riper experience, the far-reaching application of the idea. The further we work and study on any problem the more the complex features fade away, and we finally get to the more simple and rational principles. The fight against gypsy and brown-tail moths has gone on up to now, and must continue, but it is believed that at the present time, although we have paid much for our experience and knowledge, we are in a far more satisfactory position to cope with them than most people realize. I do not wish to be misunderstood, for I am not saying that these insects are under control by any means, but I feel that if any intelligent person desires honestly to combat these pests, under any and all conditions, already there have been determined rational ways and methods which are effective.

Better methods of forestry management, which in the case of the moth-infested sections of the State will greatly depend upon silviculture, can be made extremely effective. Had we known what we do to-day it would have been a very simple thing to have saved the innumerable magnificent evergreens that were destroyed by the gypsy moth. As time has gone on, better organization and greater insistence for improved methods, materials, equip-

ment and machinery, together with natural and imported enemies and a more intimate knowledge of their workings, have all helped just so much. We need, therefore, combined co-operation to get the efficiency desired.

There is little question but that much of our work in the past, although effective, nevertheless has been altogether too expensive. The old idea of tearing down and burning out stone walls to destroy egg clusters appealed to some as effective, and it was, but to-day it is entirely abandoned. A few years ago burlap was used by hundreds of bales, and nearly every tree had a petticoat; but during the past season the ones seen were largely those hanging on from previous years, rather than new ones, other methods having proved better and taken their place.

To come to real fundamentals, our purpose in fighting the moths is to save our trees. We value our trees for two purposes — first their æsthetic value for ornamental shade and beauty; and second, their economic value, as lumber and other forest products.

To get the best results with trees it is necessary to comprehend their wants in a very broad way. Adaptation of soils, proper distance apart for development, protection from forest fires in the country and leaky gas pipes and pavements in the cities, fungous diseases, insects, etc., must all be considered, each in its proper time and place.

In order, therefore, to combat any one of the above conditions or depredations the case as a whole first needs diagnosing. Now, if the brown-tail moth is the greatest factor to contend with the simplest solution is to grow evergreens, eliminating the hardwoods, as the brown-tail never touches evergreens. There are whole forests of evergreens alone in Europe. In the case of the gypsy moth it also so happens that where there are clear stands of evergreens this insect is little to be feared. It is for this reason that on the North Shore, for example, it will be seen that the oaks, which this insect adores, and other hardwoods are cut out, and the evergreens, like pine and hemlock, are retained and encouraged.

Without going further into detail, the point I desire to make is that a trained forester can and will, through his knowledge of the difficulties likely to be encountered with the gypsy and brown-tail moths, select his species and prepare and handle his wood

lots or forests in such ways as to obviate the difficulties. Through our observations we have found that many of our hardwoods species also are comparatively immune from these moths. The ash, locust, hickory and others, if selected and planted independently of those trees most coveted by the moths, would be relatively free. (See table, page 29.) If, in addition to silvicultural methods, as indicated, we also practice up-to-date forestry management by keeping the stand thinned out of dead wood and inferior and weakened trees, the results would be appreciable. Forest fires running through woodlands leave them in an unhealthy and unprofitable state, and it is here that moths and other depredations get their start, as the owner loses interest in such growth and feels it is not worth working with. These become the breeding places that later cause so much trouble.

With modern methods of management our forests will improve in every way. A forest properly thinned is more easily cared for, no matter what attacks it. Wherever we find wild, neglected woodlands, thickets and tangles along highways, or run-down and neglected estates, there are invariably the places where we expect to find the gypsy moth entrenched.

The first thing to be done with all our woodlands, therefore, is to practice modern forestry management for the benefit of future products, regardless of moths or other depredations; then let come what may, conditions are of the best for overcoming them.

There is little to be gained in treating egg clusters and combating insects on dead, decaying or illshaped and weed trees and stumps, as one's efforts ought to be centered on those that have prospective value.

The State Forester and his staff of trained assistants stand ready to assist any and every one in the State in the practice of modern forestry management. This once well established we predict that the insect depredations will be largely under control.

FOREST TREES RESISTANT TO THE GYPSY MOTH.

With a view to finding out which species of trees are most resistant to the gypsy moth under general forestry conditions, the following data as to the feeding habits were collected by a trained forester. The work extended from July 10 to July 24, in areas which had been stripped by the gypsy moth. Sixty-

five plots were made for the examinations, located in 39 areas of stripping in 16 towns and the city of Boston. On 42 of these plots the trees were counted by species in $\frac{1}{4}$ -acre circles; 8 were in scrub growth, or not much larger; the others were taken wherever conditions were favorable for getting comparative conditions for a fair study. In every case an estimate was made of the percentage of stripping, by species.

The table shows the average percentage of strippings of the different species on the plots actually counted.

PERCENTAGE OF STRIPPING.

SPECIES.	Percentage.	Basis (Number of Trees).
White oak,	94.0	871
Red oak,	89.0	156
Black oak (including scarlet),	84.0	1,084
Chestnut,	63.0	39
Hickory,	37.0	104
Red maple,	20.0	67
Gray birch,	14.0	365
White birch,	1.5	4
Beech,	72.0	8
Ash,	12.0	31
Black locust,	2.5	2
White pine,	5.0	127
Pitch pine,	-	5
Red cedar,	-	43
Black birch, ¹	50.0	5 ²
Elm, ¹	10.0	5 ²
Scrub oak, ¹	88.0	50 ²

¹ Not on counted plots.

² Estimated.

This gives a fair estimate of the comparative resistance to the gypsy moth of the different species, with the exception of red oak. It so happened that the greater number of trees of this species observed were on areas where the stripping was particularly heavy, while on the areas where the general stripping was lighter there were very few red oaks. Thus the average obtained is exceptionally large. The individual plots show that where red

oak occurred with one or more other species of oak, it was stripped on an average of 10 per cent. less than any other. The detailed figures of the separate plots are not submitted with this report, but are kept on file for reference if needed.

A number of cases were observed in which white oaks showed less stripping than the surrounding trees. In these cases the greater part of the white oak leaves were of recent growth. This and the presence of brown-tail pupa cases seemed to indicate that the white oaks had been stripped by brown-tails early in the season. At the time of the gypsy work there was little foliage left on these trees, and consequently the gypsy caterpillars either died or migrated to neighboring trees. The new leaves sprouted before the end of the gypsy season, but the caterpillars did not return to the white oaks.

Signs of the wilt disease were seen in most of the areas examined. In many cases this was undoubtedly natural.

A number of egg clusters were examined. None of these contained more than approximately 250 eggs, while many were much smaller. This is a natural result of the stripping, which prevented the caterpillars from obtaining their full growth.

EXAMINATIONS OF WOODLANDS.

Our well-founded policy of encouraging private woodland owners to manage their holdings according to established forestry principles has been continued very successfully during the past year. The number of examinations made (showing an increase over last year) seems to justify the hope, expressed in our last report, that this line of work is becoming sufficiently well known to be taken advantage of by citizens all over the State.

Chestnut Bark Disease.

While the number of examinations of woodland for the purpose of giving advice in forestry management has surpassed last year's mark, as noted, the work of examining for bark disease, which was then just beginning, has increased very rapidly indeed, so that in place of the 6 examinations made last year we are able to report a total of 28, not including several inspections made of lots previously examined. The wide prevalence of the disease

gives us every reason to believe that this work will increase rather than diminish during the coming year.

The two following tables give lists of the forestry and bark disease examinations made during the past year.

EXAMINEE.	Town.	Area (Acres).	Cost.
Adams, Chas. F.,	Concord,	300	\$0 75
Alexander, Samuel,	Northfield,	30	4 00
Allen, G. H.,	Billerica,	50	39
Amesbury Park Board,	Amesbury,	6	4 08
Andover Park Board,	Andover,	25	1 00
Angier, E. H.,	Ashland,	30	1 05
Balch, Anna L.,	Boston,	1	-
Balch, Francis N.,	Billerica,	87	40
Barton, N. B.,	Sharon,	2	50
Bay State Street Railway Company,	Avon,	6	45
Bay State Street Railway Company,	Dighton,	1	75
Bay State Street Railway Company,	Taunton,	10	75
Bay State Street Railway Company,	Westwood,	10	20
Brookline Water Commissioners,	Dedham,	-	-
Brookline Water Commissioners,	Needham,	-	-
Brookline Water Commissioners,	Boston,	350	- ¹
Clark, Mrs. Elton P.,	Frammingham,	10	1 10
Commission Public Works,	Lynn,	2,600	40
Crane, Dr. Clarence E.,	Dover,	40	15
Crocker, Mrs. Annie W. P.,	Foxborough,	175	1 30
Curtis, Frederick H.,	Dover,	16	57
Dame, J. R.,	Marshfield,	40	1 28
Dean, Herbert W.,	Cheshire,	2	- ¹
Dennison Manufacturing Company,	Frammingham,	52	1 00
Fales, L. F.,	Walpole,	60	1 00
Fitzpatrick, Thomas M.,	Hopkinton,	80	50
Fuller, Edward,	North Andover,	108	70
Gordon, Dr. W. C.	Littleton,	15	1 30
Guptill, H. E.,	Georgetown,	4	2 94
Hathaway, M. B.,	Wilmington,	36	80
Hillside Industrial School,	Greenwich,	8	-
Houghton, L. T.,	Sutton,	50	2 20
Hunnewell, Hollis,	Natick,	250	2 43

¹ Transportation furnished.

EXAMINEE.	Town.	Area (Acres).	Cost.
Lawrence, James,	Groton,	250	\$4 18
Lufkin, C. O.,	Hubbardston,	60	1 50
Lythgoe, Mrs. Wm. F.,	Sharon,	4	50
Manning, John B.,	Boston,	4	25
Marlborough Water Commissioners,	Marlborough,	20	1 16
McQuaid, John,	Pittsfield,	40	-1
Means, Anne M.,	Andover,	5	92
Merrill, Dr. John L.,	Pembroke,	36	-1
Morgan, Paul B.,	Hubbardston,	40	5 25
Mount Holyoke Company,	Hadley,	240	6 55
Osgood, Isaac,	North Andover,	7	75
Parkinson, John, Jr.,	Dover,	14	-
Peabody Water Works,	Peabody,	98	80
Pierce, M. E.,	Berkley,	75	-
Place, C. A.,	Sterling,	30	1 60
Rogers, Edward H.,	Lincoln,	25	80
Sanderson, Geo. A.,	Littleton,	100	1 08
Sedgwick, Ellery,	Ipswich,	40	1 25
Shaw, J. Holbrook,	Plymouth,	10	1 60
Souther, Mrs. C. H.,	Boston,	2	-
Springfield Water Commissioners,	Blandford,	5	-
Springfield Water Commissioners,	Belchertown,	5	4 50
Sudbury Poor Farm,	Sudbury,	100	74
Walpole, town of,	Walpole,	19	-2
Wellesley College,	Wellesley,	15	-2
Westborough Insane Hospital,	Westborough,	10	2 72
Whitin Machine Works,	Northbridge,	40	2 78
Total, . . . . .	. . . . .	5,748	-

¹ Transportation furnished.² No expense.

EXAMINEE.	Town.	Area (Acres).	Disease Present.	Cost.
Ames, John S.,	Easton,	100	(?)	\$0 90
Ames, Oakes,	Easton,	100	Yes.	-
Bay State Street Railway Company,	Avon,	5	No.	-
Bird, C. S.,	Walpole,	50	Yes.	80
Bowlker, Nathaniel,	Framingham,	100	No.	-
Briggs, F. H.,	Sharon,	30	Yes.	-



View of a fireline at Darmstadt, Germany, taken by the Massachusetts State Forester. The soil is a deep sand and the trees are *Pinus sylvestris*. Our Cape lands are far superior to this.



A view of a paved street extending through the government forest in the proximity of Brussels, Belgium. This large forest tract is mostly beech, and is valued æsthetically as well as economically.

EXAMINEE.	Town.	Area (Acres).	Disease Present.	Cost.
Burlen, Wm. H.,	Sherborn,	80	Yes.	-
Carpenter, S. I.,	Sharon,	6	Yes.	\$0 80
Channing, Walter M.,	Wellesley,	47	Yes.	-
Clark, Mrs. Elton P.,	Framingham,	30	No.	-
Codman, M.,	Framingham,	10	No.	-
Daniels, F. T.,	Sherborn,	1 tree.	No.	-
Felton, Fred S.,	Bolton,	150	Yes.	1 60
Hannum, William H.,	Williamsburg,	200	Yes.	-
Hyde, Louis C. (trustee),	Chicopee,	400	Yes.	4 45
Hyde, Louis C. (trustee),	Springfield,			
Joslin, Elliott P.,	Oxford,	3	Yes.	-
Lasell, C. W.,	Northbridge,	10	No.	2 95
Marshall, Lewis P.,	Walpole,	10	No.	80
Metropolitan Water Board,	Marlborough,	-	Yes.	-
Metropolitan Water Board,	Clinton,	-	Yes.	-
Metropolitan Water Board,	Southborough,	50	Yes.	-
Packard, Mrs. J. S.,	Seekonk,	2	Yes.	2 00
Pearmain, J. D.,	Framingham,	70	Yes.	40
Pierce, Mrs. E. J.,	Newton,	½	No.	-
Saltonstall, John L.,	Bolton,	152	No.	1 00
Smith, Harry W.,	Grafton,	60	Yes.	1 30
Sylvester, H. D.,	Williamsburg,	20	Yes.	-
Trott, George S.,	Bolton,	5	No.	-
Warren, Fiske,	Harvard,	600	Yes.	2 77
Total, . . . .	. . . .	2,291½	-	-

SURVEYING.

The work of surveying land turned over to the State for planting, mentioned in our last report, has this year been pushed to completion, so that we now have on file maps for all lots planted by us under the reforestation act. This undertaking has involved the survey and mapping of 22 separate lots of land in all parts of the State, comprising a total area of 915 acres. Following is a list of these lots:—

NAME OF LOT.	Town.	Area (Acres).
Ballou,	Shirley,	17½
Bent,	Hubbardston,	69
Bent,	Hubbardston,	111
Cadwell,	Pelham,	7½
Cadwell,	Pelham,	16½
Civic League,	Nantucket,	83
Clark,	Holden,	55
Dean,	Rutland,	55
Dewar,	Carlisle,	35
Fenno,	Westminster,	35
Flint,	Andover,	38
Fullam,	West Brookfield,	75½
Gerrett,	Greenfield,	4
Glazier,	Leverett,	66
Glazier,	Leverett,	25
Killam,	Rowley,	31
Lamb,	Hubbardston,	51
Parkinson,	Dover,	14
Stone,	Brookfield,	40
Wilson,	Spencer,	15
Wilson,	Spencer,	25
Wilson,	Spencer,	46
Total, . . . . .	. . . . .	915

The total surveyed area for which maps have been made by the forestry department is now 1,558 acres.

STEVEN'S ESTATE, WARWICK.

In October of last year this office made an examination and report on 55 acres of land belonging to the Steven's estate in Warwick. One-half of this area had been logged some years before, and had come up to a growth of hardwood sprouts and bushes. We advised in our report that this land should be deeded to the Commonwealth and planted by this office under the terms of the reforestation act. This was done and the land was planted last spring.

About two-thirds of the remaining 30 acres was covered with a second-growth stand of tall sapling pines; the remaining third

held a hardwood stand of sprout chestnut, white birch, oak and maple. It was advised in our report that the pine stand should be thinned, that is, the crowded, slow-growing trees should be cut out, and that the chestnut and white birch among the hardwoods should be removed. It was thought advisable to cut the chestnut on account of the danger of infection by the chestnut bark disease, and the white birch, because it was mature and seemed to be deteriorating in quality.

The recommendations of our report in regard to the thinning were accepted by the trustees of the estate, and six of our men, with one of our most experienced foremen, were set to work in the woods. The Steven's estate paid the entire cost of the work, including the expenses of the forester from this office who marked the trees and supervised the work. Arrangements were made with Mr. Williams, a local lumberman, to take the logs on the ground for \$8 per M feet. Considering the conditions this was a very fair price. The slash and dead wood were piled but not burned, as it seemed impossible to do this without scorching and killing many of the standing trees.

The financial results of this operation should interest those who have wood lots in which thinning is a possibility. The amount of lumber sawed from the logs came to 235,000 board feet, and at the selling price of \$8 per 1,000 the gross returns were \$1,880. The labor cost of chopping and slash piling was \$600; tools, \$30; supervision, *i.e.*, expenses of the forester, \$25; miscellaneous, \$15; total, \$670, or \$2.90 per 1,000 feet. This leaves a net return of \$5.10 per 1,000 feet, — a very good margin of profit for an operation carried out primarily for improvement to a wood lot situated more than 10 miles from the railroad.

EXPERIMENTAL THINNING.

A work which should prove to be of considerable interest when the final results are obtained has been begun in the town of Cheshire. The object of this undertaking is to learn the cost of thinning out the valueless species among the thick second-growth hardwood which comes up on the slopes of the Berkshires after the older trees have been cut off.

These slopes are covered largely with this sort of growth, which in the course of fifty years or so, by a process of natural thinning,

again becomes fit for fuel. If it can be shown that the growth of these trees can be so hastened by cutting out the inferior species as to produce the same amount of fuel wood per acre in thirty-five to forty years as now grows in fifty, and if this work can be done for a sufficiently low price per acre to make the financial result profitable, then the purpose of this experiment will have been fulfilled. For a woodland owner can well afford to pay the cost of removing these poorer trees, even when too small to be of any value, provided the remaining trees grow much faster and straighter, and show better quality.

While it is our belief that this result will be accomplished, we have no actual data at hand to prove it. As we always have held that facts are more useful than theories, we hope by the time four or five years have elapsed to be able to show conclusive results.

The method of making the experiment was this: two quarter acre plots were laid off side by side, so marked as to be clearly distinguishable. One of these plots was left untouched; the other was marked by a forester and all the marked trees were cut and drawn out. Data as to costs, number of trees thinned, number left, etc., are not available at this writing, but soon will be, and examination of the plots from year to year will reveal the progress of the growth. When sufficient time has elapsed we hope to have at hand "visible" data, so to speak, of a sort which, so far as we know, does not now exist in this section of the country.

FOREST WORKING PLAN.

One working plan has been made this year for the forested watershed of the city of New Bedford, in the towns of Freetown, Lakeville, Middleborough and Rochester. As a printed report of the working plan has been published by the city only a brief summary will be given here.

The complete plan consists of (1) an examination, with estimates and recommendations; and (2) a forest map based upon surveys, both area and timber; it was made as the result of a preliminary examination made by us in September, 1911, and covers an area of 1,510 acres.

The growth was divided into types, each of which was estimated separately. Then general recommendations, divided principally into thinning, planting, establishment of a nursery and

provision for fire protection, were made, followed by specific treatment for each type. A table was included giving instructions for handling a given portion of the tract each year, so that after a certain period has elapsed the whole area will be under management.

The city has begun to follow out the recommendations made in the report, and last spring started a nursery under the direction of this office.

REFORESTATION.

The reforestation policy of this office has been gaining strength throughout the Commonwealth by the awakening of the interest of private land owners in this kind of work. The fact that New Hampshire is also endeavoring to pass a similar law shows our reforestation law to be one of merit.

The work done during the past four years under the provisions of the reforestation act is beginning to show the practicability of planting forest trees on our waste lands. The plantations set in 1909 and 1910 are now large enough to attract the attention of people passing by.

This office has, up to the present time, planted about 80 lots of land in different sections of the State. During the past summer all these plantations were inspected, and reports made on the conditions of each lot. Where a considerable number of trees had died from the severe drought of the summer of 1911, or from other causes, it was decided to fill in the blanks so caused with new trees. This part of the work has been pushed with vigor during this fall, so that now nearly all of the 1909 and 1910 plantations are in good condition, and need no further attention beyond the cutting of brush and protection from fire.

A few of the plantations set late in the spring of 1912 were somewhat affected by the drought of this past summer, and will require some filling in another year.

Twenty-nine plantations, comprising a total acreage of 810 acres, were set out this past year with three and four year old transplant stock, all raised in our own nursery at Amherst. The number of trees set amounted to more than a million.

We also cleared and burnt over an 87-acre tract of cut-over pine land upon which the slash was very dense. A fire line was built along the entire length of the west side of the lot where it

adjoins the railroad. This land will be planted the coming spring. We have on hand at this time about 500 acres of land for planting in 1913, and expect to add materially to this amount.

We feel that that portion of the reforestation law which limits the price of land to \$5 per acre should be amended to read \$10, because with the present low limit it is difficult to obtain land situated in places where the plantation can be seen by any considerable portion of the public, so that the educational effect of the law is largely lost.

FOREST NURSERY.

Our special appropriation of \$4,000 for nursery work has enabled us to reach the goal which we have long desired, namely, to raise in our own nursery an amount of transplant stock sufficient for our own needs and also be able eventually to supply forest nursery stock to State institutions and commissions. During the past year we furnished the Metropolitan Water and Sewerage Board with 250,000, the Mt. Wachusett Reservation Commission with 20,000 and the Westfield State Sanatorium with 5,000 two-year-old white pine seedlings.

During the past few years we have lost a portion of our seedling and transplant stock from drought, and have been handicapped because there was no water supply at the nursery. This last spring we laid a water pipe, with uprights for hose connection at regular distances, in the Amherst nursery. This system was connected with that of the Massachusetts Agricultural College. At Sandwich we draw the water from a pond, and make use of one of the old discarded power sprayers transferred from the gypsy moth division for pumping purposes. This works well.

The seedlings of this year promise to make a fine stand and the transplants have also made remarkable growth. We have tried the experiment this year of doing a large amount of fall transplanting, and the small trees appear to be in fine condition and able to stand the coming winter weather. In addition to the stock at our Amherst and Sandwich nurseries we have at Hopkinton about 125,000 four-year-old white pine transplants which were not used this past year. The equipment at Amherst has been increased by a large shed to hold boxes and baskets, and at Sandwich a shed was built to hold the sprayer pump mentioned above.

From our nurseries we shall have on hand next spring over a million and a half three and four year old pine and spruce transplants, and a very large number of two and three year old seedlings. A table showing the stock in our various nurseries follows:—

SANDWICH NURSERY, 1912.

VARIETY.	Age (Years).	Number of Trees.
Catalpa speciosa seedlings,	3	3,000
Black locust seedlings,	4	8,500
Black locust seedlings,	3	4,700
Honey locust seedlings,	3	2,800
Scotch pine seedlings,	3	25,000
Scotch pine seedlings,	1	50,000
Austrian pine seedlings,	2	20,000
Pitch pine transplants,	4	114,000
Black locust transplants,	4	114,000
Norway spruce transplants,	3	85,500
Jack pine transplants,	3	500
Total,		428,000

HOPKINTON NURSERY, 1912.

White pine transplants,	4	125,000
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AMHERST NURSERY, 1912.

White pine seedlings,	1	1,701,100
White pine seedlings,	2	1,332,800
White pine seedlings,	3	259,200
Red pine seedlings,	1	187,900
Norway spruce seedlings,	1	211,200
Norway spruce seedlings,	2	1,015,800
European larch seedlings,	1	47,500
White ash seedlings,	1	65,000
White ash seedlings,	2	7,500
Catalpa speciosa seedlings,	2	1,700
Chestnut seedlings,	2	1,000
Maple seedlings,	2	200
Total seedlings,		4,830,900

AMHERST NURSERY, 1912 — *Concluded.*

VARIETY.	Age (Years).	Number of Trees.
White pine transplants,	4	82,500
White pine transplants (spring),	3	725,300
White pine transplants (fall),	3	589,000
Norway spruce transplants,	4	15,000
Red pine transplants,	3	14,000
Fir balsam transplants,	3	22,400
Hemlock transplants,	3	2,800
Arborvitæ transplants,	3	7,000
Total transplants,		1,458,000
Grand total,		6,288,900

PLANTING DONE UNDER THE ADVICE OF THIS OFFICE.

NAME.	Town.	Variety.	Number of Trees.
Metropolitan Park Commission, .	-	White pine,	250,000
Wachusett Reservation Commission, .	-	White pine,	20,000
Daniel O'Brien,	Rowley,	White pine,	5,000
F. W. Williams,	Northfield,	White pine,	2,000
Marlborough Water Board,	Marlborough,	White pine,	20,000
Springfield Water Commission,	Blandford,	White pine,	5,000
Springfield Water Commission,	Belchertown,	White pine,	5,000
Charles G. Washburn,	Princeton,	White pine,	2,600
Fall River Water Commission,	Fall River,	White pine,	20,000
New Bedford Water Commission,	New Bedford,	White pine and Norway spruce.	30,000

STATE PLANTATIONS, 1912.

TOWN.	Acres.	Type of Land.	Variety planted.
Templeton,	50	Cut-over,	White pine, Norway spruce.
Heath,	80	Run-out pasture,	White pine.
Hopkinton,	28	Sprout land,	White pine, Norway spruce.
Buckland,	11	Cut-over,	White pine.
Hopkinton,	80	Cut-over,	White pine, Norway spruce.
Norwell,	10	Cut-over; pasture,	White pine.

STATE PLANTATIONS, 1912 — *Concluded.*

TOWN.	Acres.	Type of Land.	Variety planted.
Ashburnham, . . .	28	Pasture,	White pine.
Barre,	38	Cut-over,	White pine.
Dover,	13½	Cut-over,	White pine.
Oakham,	80	Cut-over,	White pine.
Becket,	10	Pasture; mowing, . . .	White pine.
Duxbury,	38½	Cut-over,	White pine.
Warwick,	28	Cut-over,	White pine.
Wellfleet,	6½	Cut-over; sandy, . . .	Scotch pine.
Ashburnham, . . .	70	Old pasture,	White pine.
Paxton,	50	Cut-over,	White pine.
Greenfield,	4	Old field,	White pine.
East Brookfield, . . .	30	Cut-over,	White pine.
Hubbardston, . . .	15	Cut-over,	White pine.
Belchertown, . . .	6	Old pasture,	White pine.
Shirley,	18	Cut-over,	White pine.
Shirley,	10	Old pasture,	White pine.
Hubbardston, . . .	12	Cut-over; plain, . . .	White pine.
Lancaster,	40	Cut-over; plain, . . .	White pine.
Ashburnham, . . .	19	Old field,	White pine.
Ashburnham, . . .	6	Old field,	White pine.
Ashburnham, . . .	4	Old field,	White pine.
Dennis,	20	Cut-over sprout, . . .	White pine, Austrian and Scotch.
Spencer,	5	Cut-over,	White pine.

PROPOSED PLAN FOR DOING FORESTRY WORK ON STATE RESERVATIONS AND ON STATE LANDS.

There are many State institutions and reservations that have areas of land that should be placed under better systems of forestry management, either by proper thinning or reforestation. The State Forester is in a position to assist these institutions in the future by offering them young trees from his nurseries free of charge. He also will be at their service in outlining systems of forestry management and in assisting in other ways in establishing a definite forest policy. Surely those in charge should be able to find some source whereby the manual labor expenses could be met. In consulting with the Greylock Reservation Commission, for example, we find that they are under considerable outlay in

maintaining roads, and the general expenses are as much as they are able to finance. With an acreage of 8,000 acres, some of which is wooded and a large percentage of it capable of being reforested, it would seem that the State is derelict in its duty in not setting the private land-owner a good example by practicing upon its own land the principles of forestry management. What is true of Greylock is more or less true of other reservations and lands owned by the State at various institutions.

As a means of getting some real active forestry work started on these lands the State Forester might be given a small yearly appropriation for doing work of this sort in co-operation with the various boards. Should this be done it is suggested that the receipts from this work thereafter should be turned over to the State through the State Treasurer. Were we to spend \$5,000 a year simply for manual labor in thinning existing growth or setting out young trees, it will be seen that the expenditure would go very far toward getting done just what is necessary.

FOREST TAXATION.

It has long been known to the observant that the present unjust method of taxing forest lands has constituted one of the most formidable obstacles to the development of forestry in this State. Under the present law all property, both real and personal, is subject to taxation to provide the revenue necessary to defray the running expenses of municipal, State and national government. This law applies to forest lands the same as to other kinds of property, and requires an annual assessment of taxes based upon the true value of the land, together with the trees growing thereon. The evil of this common practice has been made painfully apparent by the action of the owners of such property, who to escape this burdensome tax seek relief by cutting and marketing the trees while very immature, and long before they have attained their highest commercial value. The question of taxation has also served to retard the progress of the reforestation movement, the importance of which to the economic welfare of the State is of such magnitude as to fairly entitle it to any reasonable concession, of whatever nature, which may have a tendency to encourage and foster it. By the authority given it by the amendment to the Constitution adopted by the voters



The State Forester's nursery at Amherst, taken in July.



A Scotch pine plantation on the estate of Mr. Charles Francis Adams in Lincoln, Mass.

at the last State election, the General Court of 1913 will undertake the rather difficult task of solving the forest taxation problem by legislation.

So intricate is the subject, and so vital is it that proposed legislation along this line should be thoroughly well considered, that the Boston Chamber of Commerce has joined with the Massachusetts Forestry Association in the appointment of a committee to study the problem and to prepare a bill designed to eliminate many of the objectionable features of the present method of taxing these lands. It is difficult to determine, or even forecast at this time, in just what form this bill will be presented to the Legislature for its consideration.

That which is needed is such changes in the present method as will encourage tree planting and the conservation of forests without relieving the forest owner of his responsibility of giving his just share toward the support of government. If this taxation problem is successfully worked out, a long step will have been taken in the right direction, and forestry will eventually become one of the leading factors in contributing to the wealth and prosperity of the State.

PRESENT CONDITIONS REGARDING THE CHESTNUT BARK DISEASE IN MASSACHUSETTS.

While the whole forestry staff has been on the lookout for this disease throughout the year, nevertheless it was deemed best to have a general inspection of the State made, and Mr. John Murdoch, Jr. was delegated to do this. He visited the worst infected sections that he was familiar with from his work of last year, and submitted the following report: —

In southern Berkshire County the disease, as has already been reported, is almost universally distributed. A number of cases were found which had not previously been reported, either from having been overlooked under the conditions of observation last winter, or in territory not then covered. A number of cases also were discovered which had first become evident during the past summer, amounting in all to perhaps 100 per cent. increase. Careful examination of many cases, however, led to the conclusion that most of the apparent increase was due to lesions which had started in 1911, but which had not killed the host until 1912. On trees

which were previously infected, the disease seems to have made comparatively little headway during the past season. Even at the locality in Alford which was reported as the worst seen in the State last year, and which still maintains that reputation, no new trees seemed to have died, and the disease had increased but little. A few new lesions were observed in some places throughout the county, principally on small twigs, including one apparently on the new growth of the year.

A former employee of the Pennsylvania Blight Commission says that the infection in this region is more general than he has seen it even in eastern Pennsylvania and New Jersey. In these States the diseased trees occur in more or less widely separated groups, while here they are commonly uniformly distributed throughout the stand.

In Wilbraham and Hampden, Hampden County, the disease is as widely distributed as in Berkshire County, and the increase for 1912 is apparently no greater. On one tract of sprout growth observed by Mr. Robert I. Edson, forest warden of Wilbraham, on which every tree is attacked, the disease has made very little headway the past year. Mr. Edson is the man who first called the attention of this office to the presence of the disease in Massachusetts.

Lumbermen in Hampshire County say that the disease has made a great spread there. It seems probable, however, that this is due rather to better recognition of the disease than to an actual increase.

In southeastern Worcester County very little fresh work was seen. In particular, one of the group of sprouts in the town of Douglas, photographed in January, 1912, which at that time had a fair-sized canker on the trunk, was on October 3 still green in the top. The canker was larger but had not spread completely around the trunk, although this was only four inches in diameter. The larger tree, photographed the same day, had lost only one additional branch.

All over the State, with the possible exception of Hampshire County, as noted above, the disease seems to have made much less headway than was to have been expected from its previous rate of spread.

It is reported that experimental inoculations in Pennsylvania

show that the disease develops more rapidly in the valleys than towards the top of the ridges. Mr. Edson states that he has observed the disease growing much more rapidly in trees on the edge of a fertilized field than in trees on a rocky knoll near by.

Successful inoculations are said to have been made on a number of other trees besides chestnut, including oak, — species not given, — tulip-poplar, and sumach, though there are no reports of natural infection on these trees.

A recent writer in "Phytopathology" states that he has determined the fungus known in Europe as *Endothia radicalis* to be identical with the so-called *Diaporthe parasitica* of America. This fungus, although long known, has never been reported as producing any disease in Europe. This article is simply a confirmation of the identification made some time ago by Dr. W. G. Farlow. It is said that inoculations with the European fungus on American chestnuts have produced the disease.

It has been discovered that, under favorable conditions, the ascospores — the "winter spores" of the publications — may be shot to a distance of several centimeters from the surface. They may then be taken up by the wind and carried to an indefinite distance. The possibility of spreading by the wind was suggested in the pamphlet published by this office last spring. The spores are covered with the sticky contents of the ascus, and adhere firmly to whatever they strike. It is impossible to blow them from a plate of glass even, and very difficult to wash them off with a stream of water.

The phenomenon shown in Figure 1 of the above pamphlet is probably not the early stage of the disease, as there stated. It is undoubtedly caused by an insect called the "Chestnut Bast Miner," the larva of which was only recently discovered. The adult is as yet unknown. The galleries of this insect do, however, form a very common point of attack for the disease.

The Bureau of Entomology has recently announced the discovery of five species of insects which feed on the pustules of the bark disease fungus, and by thus destroying the spores check its spread to a greater or less extent.

Record has been made of all known stations of the disease in this State on a set of maps kept for that purpose.

DANGER FROM SLASH.

It is thought best to call attention again to the great forest fire losses occurring yearly from the slash following logging operations. In a State like Massachusetts, where during the summer season our population is spread throughout the country, the chances for forest fires are very great. When fires get established in these slash areas they present a very perplexing problem and often get under such momentum that great areas are destroyed before the fire is brought under control.

The State Forester believes that if the local forest wardens were given authority to consult with the lumbermen before the operation was begun, with a view of leaving some simple fire lines for future protection of adjoining properties, much good could be accomplished. This whole question is one of education. Up to the present little attention has been given the subject, and it is not uncommon to see the brush piled upon the line fence of the abutter, or even into the highway along country back roads. A wide-awake forest warden with a little authority could quickly get the co-operation of his people, and this would greatly lessen the present dangers. The ideal method of disposing of slash is to pile and burn it at once, but this is thought too expensive by many. The next thing is to spread the brush out thinly, so that it will quickly decay, and cut it up with belts or fire lines free of slash, so that should any portion catch fire it could be held within small areas.

REPORT OF THE STATE FIRE WARDEN.

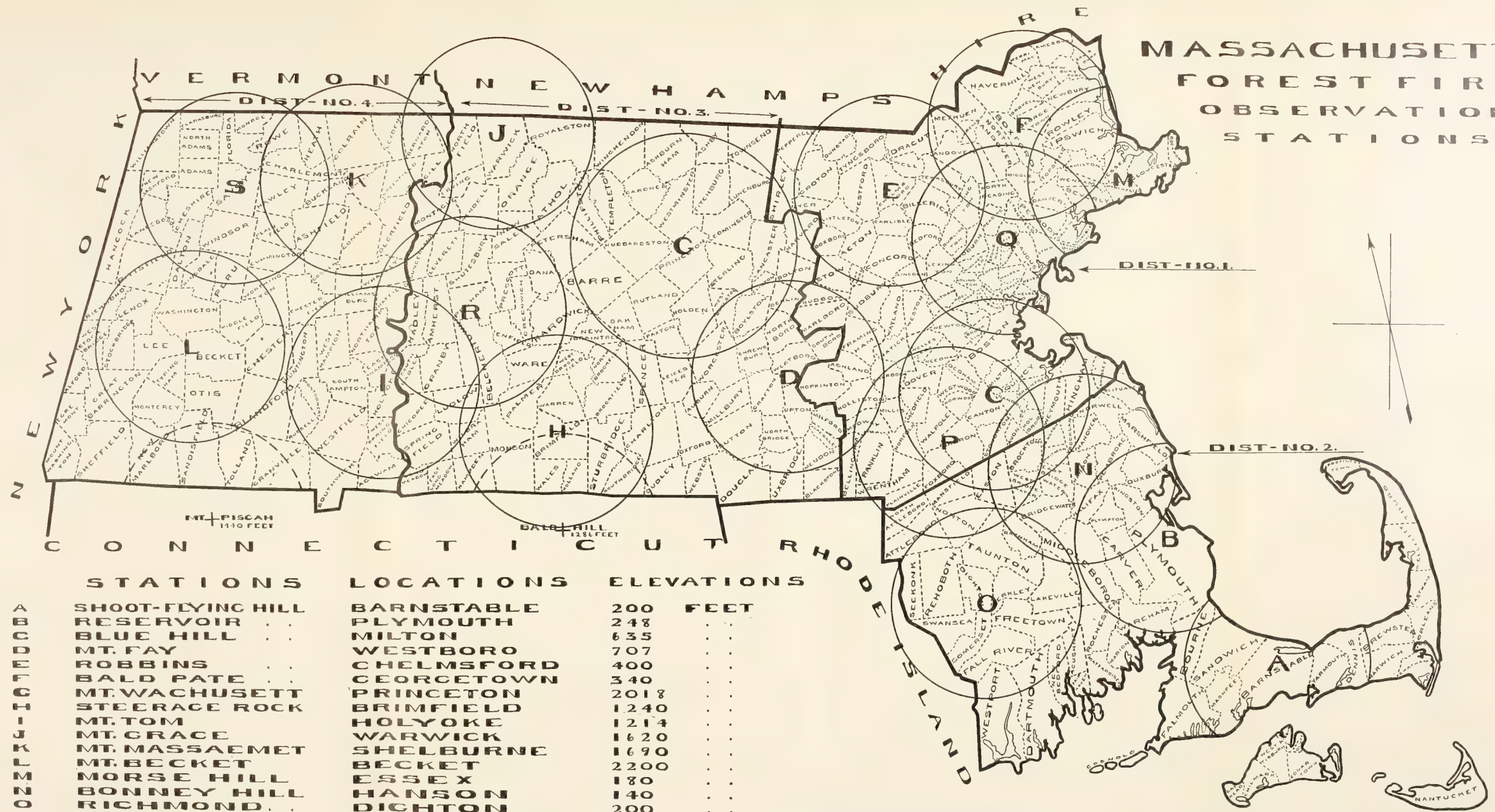
MR. F. W. RANE, *State Forester*.

SIR:— In compliance with your request I beg to submit the following report of the work accomplished by this branch of the department during the present year:—

The State has been divided into four forest fire districts, each district being in charge of an experienced and competent district forest warden, the district arrangement being as follows: District No. 1, Essex, Middlesex and Norfolk counties; District No. 2, Barnstable, Bristol and Plymouth counties; District No. 3, Worcester County and west to the Connecticut River; District No. 4, Berkshire County and east to the Connecticut River.

The principal work of the district forest wardens has been constructing telephone lines, erecting steel observation towers, map making, inspecting all forest fire-fighting equipment, visiting selectmen and forest wardens,

MASSACHUSETTS FOREST FIRE OBSERVATION STATIONS



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STATIONS	LOCATIONS	ELEVATIONS	FEET
SHOOT-FLYING HILL	BARNSTABLE	200	
RESERVOIR	PLYMOUTH	248	
BLUE HILL	MILTON	635	
MT. FAY	WESTBORO	707	
ROBBINS	CHELMSFORD	400	
BALD PATE	GEORGETOWN	340	
MT. WACHUSETT	PRINCETON	2018	
STEERAGE ROCK	BRIMFIELD	1240	
MT. TOM	HOLYOKE	1214	
MT. GRACE	WARWICK	1620	
MT. MASSAEMET	SHELburne	1690	
MT. BECKET	BECKET	2200	
MORSE HILL	ESSEX	180	
BONNEY HILL	HANSON	140	
RICHMOND	DIGHTON	200	
BLUFF HEAD	SHARON	440	
HART HILL	WAKEFIELD	240	
MT. LINCOLN	PELHAM	1240	
MT. TOWER	SAVOY	2560	

EXPLANATION
 X OBSERVATION STATIONS
 IN OPERATION IN 1911-1912.
 + NEW STATIONS PROPOSED FOR
 1913.
 MT. PISCAN AND BALD HILL ARE
 CONNECTICUT CO-OPERATIVE
 STATIONS.
 (C) RADIUS RANGE OF STATIONS
 IS 12 AND 15 MILES.

SCALE
 STATE FORESTERS
 OFFICE 1913

and showing them the importance of appointing deputy forest wardens and having them distributed advantageously in the outlying timbered districts of the towns. This work has been very satisfactory, enabling us to have a large number of deputies appointed, which adds materially to the efficiency of the fire-fighting force of the department. In visiting the different towns our district forest wardens have taken especial pains to urge upon the selectmen and forest wardens the necessity of purchasing ample forest fire-fighting equipment. Each district forest warden has under his personal supervision practically 1,250,000 acres, 70 per cent. of which is forested or denuded lands. He also has supervision over the observation stations lying within his district.

We have had in operation this year 17 observation stations, each station covering practically 300,000 acres. They were placed in operation May 1 and were discontinued November 10.

District No. 1. — We have had in this district four observation stations. Blue Hill observatory at Milton covers the Blue Hill Reservation and a large area of adjoining forest land. Robbins Hill station in the town of Chelmsford covers a portion of the watersheds of the Concord and Merrimac rivers. At this station we erected a 30-foot steel tower with a 7-foot square room at the top. We also have a station at Bald Pate Hill, Georgetown, covering a portion of the North Shore and valuable forest land adjoining. At this station we erected a 30-foot steel tower with a 12-foot room at the top. The owner of Bald Pate Hill contributed one-half toward the purchase price and erection of the tower. We also have a station at Bluff Hill in the town of Sharon, covering the forest area to the Rhode Island line. At this station we have erected a 30-foot steel tower with an 8-foot square room at the top. We have established a temporary station at Wakefield on Castle Rock. This is used during dry and hazy weather, and has been under the supervision of the fire department of Wakefield. Negotiations are now being made to erect a steel tower on Hart Hill in Wakefield, one-half of the expenses to be borne by the town of Wakefield. This station will undoubtedly be established the coming year. Arrangements have been completed for the location of an observation station on Morse Hill on the Manchester and Essex line; a 40-foot tower will be erected and a telephone line completed in readiness for the spring work. This station will protect the valuable North Shore property. It is also necessary to establish a station on Nobscot Hill in the town of Framingham, to cover a large tract of territory that we are unable to reach from other stations. With these additional stations, to be established as substations, we shall be able to completely overlook all of District No. 1.

District No. 2. — In this district we have three stations in operation, — Reservoir Hill in Plymouth, Shoot Flying Hill in Barnstable and Richmond Hill in Dighton. At Plymouth we have had the use of the Plymouth observation tower, from which we have been able to cover the towns of Plymouth and Kingston, but I find that a station located on

Monks Hill in Kingston, which is one of the highest elevations in Plymouth County, would not only cover the territory now reached from the Plymouth tower, but would also cover a large tract west and south that we are unable to reach from Plymouth. It seems, therefore, advisable that this station be changed to Monks Hill, thus giving full protection to all the surrounding territory. At Richmond Hill we have been obliged to erect a 30-foot tower with an 8-foot room at the top. At Shoot Flying Hill we have added 10 feet to the tower that was already there, making an enclosed room for the observer. This station covers a large part of the Cape forest area. It will be necessary to establish a substation at Bourne and also one in the vicinity of Bridgewater or Hanson. These two stations, covering a territory that we are unable to reach from the stations now in operation, will practically complete the system in District No. 2.

District No. 3. — We have had five stations in operation in this district: Wachusett at Princeton, Fay Mountain at Westborough, Steerage Rock Mountain at Brimfield, Grace Mountain at Warwick and Lighthouse Hill at Prescott. This last-named station will be discontinued and a new station will probably be established on Lincoln Mountain in the town of Pelham, which will better protect this territory. Steel towers have been erected at Fay Mountain and at Steerage Rock Mountain this year. It will be necessary to establish two or three substations in this district to be used the coming year. The watersheds of the Blackstone, Chicopee, Miller, Nashua, Thames, Connecticut, Deerfield and Miller rivers are protected from these stations.

District No. 4. — In this district we have had four stations in operation. Mount Tom at Holyoke, where we have been allowed the use of the observation room at the Summit House, is an exceptionally good station, as we have the use of eighteen powerful telescopes. It will be necessary to install a private telephone line for use at this station the coming year. On Massaemet Mountain at Shelburne Falls we have been allowed the use of the 63-foot stone tower, and have enclosed the top with a 12-foot octagon building. We have had an observer on Greylock Mountain during a portion of the season, but owing to the high elevation of this station the results are far from satisfactory. We are not only unable to cover the Greylock Reservation, but we are also unable to cover the large area of forest land surrounding this range. I think it will be necessary, in order to cover this territory, to establish two stations, one on Tower Mountain, in the town of Savoy, which has an elevation of 2,500 feet and a second on a high point in the town of Williamstown, or, possibly, on Berlin Mountain, just over the New York line. In case a station is established on this last-named mountain it will be necessary that some co-operative agreement be made between the States of New York, Vermont and Massachusetts relative to the installation and maintenance of the same, as such a station will cover a large forest area in these two adjoining States. We have also had in operation a station on Becket Mountain in the town of Becket. Here it has been necessary to install a tele-

phone line and to erect a 30-foot steel tower with an enclosed room at the top. It will be necessary to establish two or three more substations in this district in order to properly protect the forest area and the watersheds of the Connecticut, Deerfield and Miller rivers. One of these stations will be located on October Mountain, covering the Whitney Preserve and the Pittsfield watershed.

The results obtained from the observation stations have been very satisfactory. While it has been absolutely impossible to detect every smoke, owing to the hazy and cloudy weather, at times making it impossible to see over 8 or 10 miles (although the observer is supposed to cover a radius of at least 15 miles), yet it is very gratifying to report that out of 1,800 fires reported by the different forest wardens over 1,500 were first observed by the men in charge of the observation stations. Of the fires reported by these observers our tables show that 51 per cent. were extinguished within one hour from the time they were observed, 21 per cent. within two hours, 15 per cent. within three hours, 5 per cent. within four hours, 3 per cent. within five hours, and that but 5 per cent. burned over five hours.

It seems necessary that there be established throughout the State more substations, to be used only during dry and hazy weather, when it is absolutely impossible to protect the territory by the permanent stations.

The triangulation system which was adopted this year has proved very effective in locating fires accurately at a distance of 12 or 15 miles. I feel confident that arrangements will be made the coming season for extending this system into the States of New Hampshire, Vermont and Connecticut, thus enabling us to get readings from their observation stations bordering on the north and south of this Commonwealth.

The towers with which we are equipping our stations are constructed for permanent use, being made of heavy steel, from 30 to 40 feet high. They are constructed with an 8 by 8 foot square building at the top, which has a glass enclosure as far as possible, thus allowing the observers to be continually on the watch and protecting them from inclement weather, as well as providing a suitable protection for our maps, report blanks, telephone and all necessary equipment. These towers cost complete, all constructed on cement piers, from \$225 to \$275, the variation in price being on account of difference in locality and expense of hauling. All construction work is done entirely by our district forest wardens and observation men, and I desire to say that we are extremely fortunate in having as district forest wardens men who are capable of handling this line of work as well as all map making and telephone construction work.

FOREST FIRE EQUIPMENT.

Under an act of the Legislature passed in the spring of 1910, appropriating \$5,000 annually for forest fire prevention, all towns with a valuation of \$1,500,000 or less are entitled to 50 per cent. reimbursement on all forest fire-fighting equipment they desire to purchase, not exceeding \$500,

no town being allowed an amount exceeding \$250. This equipment must be approved by the State Forester and placed under the supervision of the town forest warden subject to inspection at least once a month by the State Fire Warden or his duly authorized assistants. There are 172 towns in the Commonwealth which come within the provisions of this act, and owing to the fund not having been exhausted in the two previous years, a special effort was made early this season to interest towns in the necessity of taking advantage of the act, thereby better providing themselves with suitable equipment. The results have proved very satisfactory. Over 60 towns have filed their applications for reimbursement. The appropriation not being sufficient, but 45 towns were reimbursed, to the amount of \$4,989.99. This exhausted the appropriation, and made it necessary to carry the balance of nearly \$2,000 due other towns over to another year.

In selecting equipment several towns have purchased forest fire wagons complete with extinguishers and Marshfield cans, while other towns, not as favorably situated, have purchased a large number of extinguishers, distributing them among their deputies in the rural and timbered districts, each deputy being supplied with at least five extinguishers with necessary charges and water cans. This department holds receipts from the forest wardens for all equipment purchased under the reimbursement act.

There are 182 towns, with a valuation exceeding \$1,500,000, which are not entitled to reimbursement. These towns are obliged to assume the total expense for whatever equipment they deem necessary. Several of them, seeing the necessity of improving their equipment, have purchased forest fire wagons and extinguishers, while other towns have purchased 30-horse power and 40-horse power motor trucks fully equipped for handling forest fires. Besides carrying the necessary equipment they are also able to carry from 20 to 30 men and make from 30 to 40 miles per hour. The towns of Plymouth, Hopedale, Winchendon, Rutland and Dover have purchased such trucks during the past year.

Our reports show the total amount expended for forest fire equipment this year throughout the Commonwealth to be \$23,389.88. The following tables show, first, an itemized statement of the equipment purchased during the years 1910, 1911 and 1912 under the reimbursement act, and the amount received by each town from the Commonwealth during that period; second, a list of the towns having purchased equipment *this year*, and the amount of reimbursement received by them.

RAILROAD FIRES.

I am pleased to report many improved conditions in the railroad fire situation. While there is no law in this State permitting inspection of locomotives by this department, through the courtesy of Mr. W. L. Larry, inspector for the Board of Railroad Commissioners, I accompanied him on several inspection trips covering a number of Boston & Albany, Boston & Maine, and New York, New Haven & Hartford locomotives. The



Forest fire observation tower, on Moose hill, Sharon.



Stevens Estate, Warwick (stand after thinning; logs on the ground).

conditions were practically the same on the different roads. Special attention had been given to the screens in the front ends, and they were found to be in exceptionally good condition, although instances were found where defective screens were in use. The chief cause of a large percentage of railroad fires seemed to be in not using necessary precaution in screening the ash pans and grates, and in allowing locomotives to operate with ash-pan slides open. Recommendations were made by the Board of Railroad Commissioners that rounded extensions or perforated plate or netting be used to close the opening between the mud ring and the top of the ash pan in the wide fire-box locomotives, and that in the flat type of ash pans perforated plate or netting be placed over the ends of ash pans, and that these nettings be securely hooked, and all openings for grate shaker levers be protected so that no fire could escape from the ash pans or grates. These improvements required several days' work on each locomotive. A report received from the Boston & Albany Railroad under date of Nov. 4, 1912, shows that they have in this State a main line mileage of 337 miles, and have in operation 356 locomotives, of which 300 have been repaired to comply with the requirements of the commission; 34 which do not comply with the requirements of the commission are still in operation, and 22 are in the shop and will be repaired before going into service. The necessary changes on the 34 above mentioned will be made during the winter.

Undoubtedly more work has been accomplished by the Boston & Maine than by any other road, when we take into consideration that they have a main line mileage of 1,200 miles and 800 locomotives in operation within this State. Owing to their loss by railroad fires last year exceeding \$200,000, a department of fire claims and fire prevention was established early in March under the supervision of Mr. E. A. Ryder, and through his efforts their fire loss in this State does not exceed \$15,000 this year. In July an appropriation of \$30,000 was made for equipping their locomotives with an improved ash pan, and for screening the space above the mud ring. Up to the present time 255 locomotives have been placed in condition, and during the coming year a large percentage of the balance will receive the necessary repairs.

All inflammable material within their right of way has been removed or burned at different times throughout the season. Dangerous places adjoining their right of way have been cleared of slash and necessary fire lines have been built. A trench three feet wide is made around each pile of ties before burning.

Special effort has been made to better train their engineers in the handling of their locomotives, endeavoring to do away with the "slipping" of engines, which has a tendency to churn the fire and cause sparks to be emitted from the stack.

The officials of this road have placed in all smoking, baggage, express, mail and caboose cars signs reading: "Save the forests. Do not throw lighted matches, cigars or cigarettes from the cars." These signs should

be placed in all cars of such nature, and in all electric cars running through forest lands throughout the State.

We experienced considerable trouble early in the season with the Central Vermont Railroad, and an inspection of their locomotives was made, with the result that nearly all of them were found in some way defective. As they had but 29 locomotives in operation throughout the Commonwealth, these were repaired and placed in very good condition within thirty days, and we experienced very little trouble with them during the remainder of the season.

Up to the present time I have been unable to procure a detailed statement from the New York, New Haven & Hartford Railroad giving a summary of what they have done in the matter of fire prevention. I understand, however, that they have 781 locomotives in operation in this State, 60 of which have been equipped with what is called the "Talmage" ash pan, which absolutely prevents the escape of coals from this source. The balance of their locomotives are being equipped at the rate of 60 each month, so that by another season a large percentage of their locomotives should be in excellent condition. The results obtained by the New York, New Haven & Hartford have not been entirely satisfactory, and I think this can be attributed to two reasons: first, it has taken considerable time to perfect an ash pan suitable for their type of locomotives, thus allowing the use of their locomotives all summer with the old ash pans; second, they still hold to their old policy of preferring to settle fire claims rather than to devote more time to ascertaining the causes of their fires and then applying preventive methods. Much better results will be obtained from this road another year.

Our railroad fire reports show that we have had 640 railroad fires, as follows: New York, New Haven & Hartford, 353; Boston & Albany, 117; Boston & Maine, 146; Central Vermont, 24; burning over an area of 5,771 acres, with a cost to extinguish of \$5,530 and a damage of \$27,955. During the year 1911 we had 685 railroad fires, burning over 29,842 acres and causing a damage of \$330,389.50. A comparison shows that, while we had nearly as many fires this year from this source, owing to the efficient work done by the railroad officials, together with the assistance derived from our observation stations and town forest wardens, the fires were extinguished without causing the serious losses of previous years.

Railroad officials claim that an inspection is made once a week of the screens in the front ends of all locomotives operating in this State, and that once a day the ash pans and grate protections are examined, showing that at the time any locomotive leaves the roundhouse or yard it is in perfect condition.

A large number of dangerous railroad fires would be prevented if property owners whose lands adjoin a railroad's right of way would devote a little time and money to removing or burning the inflammable material within 50 or 100 feet of the right of way. The same condition arises along highways running parallel with railroads and within a few feet of them when brush is allowed to accumulate.

RURAL MAIL CARRIERS.

The Postmaster-General, under date of May 31, 1912, issued an order requiring all rural mail carriers to promptly report all forest and brush fires to the nearest forest warden or deputy forest warden. We have within the Commonwealth of Massachusetts 300 rural and star route carriers, with routes averaging about 20 miles, thus giving us a patrol route of practically 6,000 miles that is traveled each day, with the exception of Sundays and national holidays. As soon as the above order became effective each carrier was supplied with a list of wardens and deputies, together with their telephone numbers and places of residence, in order that all fires observed by them could be promptly reported and extinguished.

An investigation shows that, owing to this branch of the work being entirely new, there are a large number of routes with no forest wardens or deputies residing on them; therefore it is necessary that our district wardens, in connection with the different town forest wardens, go over each route and have necessary deputies appointed residing in or near the forest areas and dangerous fire localities and having telephone connection. This work I believe will be completed during the coming winter in order that we may be in readiness for spring fires. The work accomplished by the carriers this season has been very effective. Our reports show 84 fires observed and reported, besides several fires extinguished in their incipency by the carriers.

FEDERAL CO-OPERATION.

The Weeks bill, passed in 1910, providing for the purchase of portions of the White Mountain and Appalachian Mountain regions, to be held as government reservations, also carried an appropriation of \$200,000 for the protection against forest fires of the watersheds of navigable streams in the United States. Of this appropriation \$2,500 was allotted to the State of Massachusetts, to be expended in co-operative effort in such sections of the Commonwealth as would properly come within the provisions of the bill. This restricted our co-operative work to the western portion of the State, including the watersheds of the Nashua, Chicopee, Miller, Thames, Blackstone, Hudson, Connecticut and Deerfield rivers. This allotment became available May 1, and was used for the payment of federal observation men who were placed in charge of the 9 observation stations west of the east line of Worcester County, this being the territory coming within the co-operative agreement. Of the amount appropriated, \$2,477 was expended in this work. Owing to the State appropriation not being sufficient to carry on the work mapped out throughout the State, this government aid has been very necessary, permitting us to expend a portion of our State allotment in the construction of observation stations and telephone lines, as under the terms of the agreement with the United States government the State is required to expend an amount equal to that expended by the federal authorities in protecting the above-

named territory. Owing to its being necessary to establish more observation stations within this territory in order to better protect the watersheds of these rivers, it is necessary that our federal appropriation be increased to at least \$3,500 for the coming year.

BOY SCOUTS.

We have within the Commonwealth of Massachusetts 7,000 boy scouts. These are divided into 250 separate companies, each company being in charge of a scout master or assistant scout master. As soon as the fire season started in the spring we supplied each scout master and assistant with a copy of the fire law and instruction book, thus enabling them to instruct the members of the different companies relative to the forest laws.

The reports received do not show that the boy scouts have been instrumental in causing a single fire, but do show that they have extinguished several brush fires and have patrolled the railroad right of way in different localities, extinguishing fires, and it is but fair to assume that the educational work done through the scout masters has resulted in the prevention of many fires. When necessary to have camp fires they have always complied with the law by applying to the town forest warden for the necessary permit, the same being granted when weather conditions were favorable.

PROSECUTIONS AND CONVICTIONS.

Under section 2, chapter 244 of the Acts of 1911 every forest warden or deputy forest warden is vested with authority to arrest, without a warrant any person in the act of setting or maintaining a fire in violation of the law. To the average person this may seem a very easy matter, but owing to the fact that a party must be caught in the act of setting or maintaining a fire in order to arrest and take him before a magistrate having jurisdiction in such cases, it is possible to get but a small percentage of the violators. Reports show that 16 parties have been convicted for violating the fire law during the season; also that several parties have been allowed to settle by paying to the selectmen an amount equal to the cost of extinguishment. Owing to the permit law which governs all forest or brush fires, having been in operation but two years, I have not been in favor of enforcing the law too severely by recommending arrest in every instance of violation, but have endeavored, in cases where parties were unfamiliar with the laws and had violated them unknowingly, to arrive at some satisfactory settlement.

DEPUTY FISH AND GAME COMMISSIONERS.

It is gratifying to report the efficient forest fire work accomplished by the deputy fish and game commissioners of the State. While their duties are confined, in general, to the protection of the fish and game, section 299 of the Acts of 1907 also gives them authority to arrest without warrant any person found in the act of unlawfully setting a fire, and under section 20, Revised Laws, they have power to summon necessary assist-

ance to extinguish fires, which gives them the same powers and duties as are vested in a town forest warden except that they do not have authority to issue permits. They were supplied with copies of the forest fire laws early in the season, and their names were placed on our observation list, together with their addresses and telephone numbers. The observers were instructed to call them only when necessary. The reports received at this office show that they have been instrumental in extinguishing nearly 100 fires. I believe that in future years marked results will be shown by the co-operation with the fish and game deputies during severe droughts.

PRECIPITATION, IN INCHES, FOR THE YEARS 1910, 1911 AND 1912, WITH
DECEMBER OF PREVIOUS YEAR.

MONTHS.	1910.	1911.	1912.	Normal.
December,	3.80	3.24	2.59	3.74
January,	4.89	3.07	3.87	4.12
February,	4.03	3.20	2.24	3.97
March,	1.77	3.27	5.26	4.34
April,	2.64	2.86	4.05	3.46
May,	1.60	0.89	4.03	3.37
June,	3.97	4.76	0.53	3.07
July,	2.41	4.55	4.16	3.65
August,	1.05	6.70	3.85	3.70
September,	2.29	3.36	1.71	4.36
October,	1.64	3.01	1.52	4.13
November,	5.39	5.71	3.45	3.96
Totals,	35.48	44.62	37.26	45.87

TABLE SHOWING PERCENTAGE OF FIRES OCCURRING AT DIFFERENT HOURS
OF THE DAY.

TIME.	Per Cent.	TIME.	Per Cent.
7 to 8 A.M.,	1.0	1 to 2 P.M.,	16.0
8 to 9 A.M.,	3.0	2 to 3 P.M.,	14.5
9 to 10 A.M.,	9.0	3 to 4 P.M.,	10.0
10 to 11 A.M.,	8.0	4 to 5 P.M.,	9.0
11 to 12 M.,	13.0	5 to 6 P.M.,	7.0
12 to 1 P.M.,	7.0	6 to 7 P.M.,	2.0

COMPARATIVE DAMAGES BY FOREST FIRES FOR THE PAST FIVE YEARS.

YEAR.	Number of Fires.	Acreage burned.	Cost to extinguish.	Damage.	Average Acreage per Fire.	Average Damage per Fire.
1908,	1,289	39,672	-	\$205,152	30.78	\$159 15
1909,	1,496	35,083	-	189,482	23.45	126 66
1910,	1,385	42,221	\$23,475	205,383	30.46	143 29
1911,	2,536	99,693	47,093	537,749	39.31	226 24
1912,	1,851	22,072	20,219	80,834	11.92	43 67

FOREST FIRES OF 1912.

MONTHS.	Acres.	Damage.	Cost to extinguish.	Number.
1911.				
December,	97	\$42	\$134	55
1912.				
January,	20	435	476	33
February,	5	-	7	20
March,	428	777	360	117
April,	4,756	8,884	2,223	408
May,	3,556	16,800	2,636	318
June,	1,797	12,108	2,167	181
July,	2,748	10,772	4,616	258
August,	123	444	174	28
September,	85	150	86	15
October,	7,835	28,387	6,806	358
November,	622	2,035	527	60
Totals,	22,072	\$80,834	\$20,212	1,851

COMPARATIVE CAUSES OF FOREST FIRES FOR THE PAST THREE YEARS.

CAUSES.	1910.		1911.		1912.	
	Num-ber.	Per Cent.	Num-ber.	Per Cent.	Num-ber.	Per Cent.
Unknown,	413	32.9	1,128	44.5	649	35.1
Railroad,	362	28.8	685	27.0	640	34.6
Burning brush,	203	16.2	135	5.3	93	5.0
Smokers, hunters, berry pickers,	124	9.9	158	6.2	223	12.0
Steam sawmills,	1	.1	3	.1	8	.4
Children,	75	5.9	118	4.7	79	4.3
Miscellaneous,	78	6.2	309	12.2	159	8.6
Too late for tabulation,	129	-	-	-	-	-
Totals,	1,385	100.0	2,536	100.0	1,851	100.0

INVENTORY OF EQUIPMENT PURCHASED UNDER THE REIMBURSEMENT ACT.

Town.	Axes.	Cans.	Extngs.	Hoes.	Lanterns.	Mattocks.	Pails.	Pumps.	Rakes.	Shovels.	Wagons.	Re- imburse- ment.
Acushnet,	1	10	116	-	-	-	4	1	-	-	1 ¹	\$143 22
Ashby,	-	-	12	-	-	-	-	-	-	-	-	34 50
Ashland,	-	-	6	-	-	-	12	6	-	6	-	43 27
Auburn,	-	-	70	-	-	-	-	-	-	-	-	210 00
Avon,	-	10	-	-	-	-	12	-	-	-	-	9 90
Bedford,	1	14	24	-	-	-	-	-	-	-	1 ²	249 67
Belchertown,	-	-	6	-	-	-	-	-	-	-	1	71 62
Bellingham,	-	10	20	-	-	-	-	-	-	6	-	67 22
Berkley,	-	-	14	-	-	-	-	-	-	-	-	144 00
Berlin,	2	10	38	-	-	1	12	-	3	12	1 ¹	241 45
Blandford,	-	1	16	-	-	-	-	-	-	-	-	59 80
Bolton,	-	14	12	-	-	-	6	-	-	6	-	58 40
Boxborough,	-	-	30	-	-	-	-	-	-	-	-	90 00
Boxford,	-	-	16	-	-	-	-	-	-	-	-	45 60
Boylston,	-	-	24	-	-	-	-	-	-	-	-	76 20
Brimfield,	-	10	30	-	-	-	-	-	-	-	-	99 75
Carlisle,	2	15	10	-	2	-	6	-	1	6	1 ¹	193 72
Charlton,	-	-	68	-	-	-	40	-	-	60	-	221 37
Chatham,	2	15	10	-	2	3	4	-	3	5	1 ¹	152 98
Dighton,	2	8	18	-	1	-	-	-	2	2	1 ¹	108 67
Douglas,	-	25	50	-	-	-	-	-	-	-	-	175 00
Erving,	-	-	25	30	-	-	-	-	-	18	-	86 52
Freetown,	-	24	8	-	-	-	2	-	-	48	-	87 62
Georgetown,	-	20	24	-	-	-	-	-	6	12	-	98 83
Gill,	-	5	20	-	-	-	-	-	-	-	-	65 00
Greenwich,	-	-	18	-	-	-	-	-	-	-	-	60 45
Groveland,	-	6	12	-	-	-	-	-	3	12	-	51 05
Hadley,	-	-	15	-	-	-	-	-	-	-	-	75 00
Halifax,	-	12	52	-	-	-	12	-	-	18	-	205 91
Hanson,	-	6	24	-	6	-	6	-	-	5	1 ³	250 00
Harvard,	2	7	14	-	2	3	-	-	3	12	-	201 52
Holbrook,	-	12	10	-	-	-	-	-	-	-	-	69 00
Lunenburg,	2	12	10	-	2	3	4	-	3	5	1 ¹	149 28
Lynnfield,	-	10	20	-	-	-	-	10	-	-	2 ²	246 25
Mashpee,	-	-	8	-	-	-	-	-	-	12	-	34 55

¹ One-horse.² Two-horse.³ Motor Truck.

INVENTORY OF EQUIPMENT PURCHASED UNDER THE REIMBURSEMENT
ACT — *Continued.*

TOWN.	Axes.	Cans.	Exting.	Hoes.	Lanterns.	Mattocks.	Pails.	Pumps.	Rakes.	Shovels.	Wagons.	Re- imburse- ment.
Merrimac, . . .	-	-	15	-	-	-	-	-	-	-	-	\$75 00
Middleton, . . .	-	-	16	-	-	-	-	-	-	-	-	49 50
New Braintree, . . .	-	-	25	-	-	-	-	-	-	-	-	76 87
Newbury, . . .	-	-	6	-	-	-	-	-	-	-	-	18 15
North Reading, . . .	-	-	-	-	-	-	-	-	-	-	1 ¹	134 43
Northborough, . . .	-	-	25	-	-	-	-	-	-	-	-	102 37
Norwell, . . .	-	-	32	-	-	-	12	-	-	-	1 ¹	243 87
Oakham, . . .	-	-	24	-	-	-	-	-	-	-	-	138 00
Pelham, . . .	-	-	19	-	-	-	-	2	-	-	-	76 62
Pembroke, . . .	-	-	24	-	-	-	-	-	-	-	1 ²	203 75
Petersham, . . .	2	10	22	-	2	3	4	-	3	5	1 ¹	202 55
Phillipston, . . .	-	6	14	-	-	-	-	-	-	-	-	48 65
Plainville, . . .	2	10	10	-	2	3	4	-	3	5	1 ¹	178 50
Prescott, . . .	-	-	10	-	-	-	-	-	-	-	-	48 16
Princeton, . . .	-	32	80	-	-	-	-	-	-	-	-	249 20
Raynham, . . .	3	46	30	-	6	-	12	-	9	15	3 ¹	222 23
Rehoboth, . . .	-	10	48	-	-	-	-	-	-	-	1 ¹	250 00
Richmond, . . .	-	15	15	-	-	-	4	-	-	-	-	56 20
Royalston, . . .	3	10	15	30	2	2	12	-	-	30	1 ¹	120 60
Rutland, . . .	-	12	18	-	-	-	6	-	-	-	1 ²	250 00
Sandwich, . . .	22	12	36	-	-	2	-	-	-	24	1 ¹	245 60
Shelburne, . . .	-	-	50	-	-	-	-	-	12	6	1 ¹	186 87
Shirley, . . .	-	48	36	-	-	-	-	-	-	-	-	139 50
Shutesbury, . . .	-	16	25	-	-	-	-	-	-	-	-	87 50
Sterling, . . .	-	-	25	-	-	-	-	-	-	-	1 ²	231 75
Stow, . . .	-	-	42	-	-	-	-	-	-	18	-	131 31
Sturbridge, . . .	-	11	35	-	-	-	-	-	-	-	-	116 45
Sudbury, . . .	-	-	40	-	-	-	-	-	-	-	-	250 00
Sutton, . . .	-	50	50	24	-	-	-	-	32	24	-	188 46
Tewksbury, . . .	2	-	24	-	2	-	-	-	-	30	1 ¹	174 00
Tyngsborough, . . .	-	120	20	-	-	-	-	30	12	24	-	189 80
Upton, . . .	-	-	18	-	-	-	-	-	-	-	-	128 53
Wales, . . .	2	10	40	-	2	2	-	-	-	-	1 ¹	236 77
Wendell, . . .	-	-	8	-	-	-	-	-	-	12	-	35 07
West Bridgewater, . . .	-	-	20	-	-	-	-	-	-	-	1 ¹	200 12

¹ One-horse.² Two-horse.³ Motor Truck.

INVENTORY OF EQUIPMENT PURCHASED UNDER THE REIMBURSEMENT
Act — *Concluded.*

TOWN.	Axes.	Cans.	Extngs.	Hoes.	Lanterns.	Mattocks.	Pails.	Pumps.	Rakes.	Shovels.	Wagons.	Re- imburse- ment.
West Newbury, . . .	-	10	6	-	-	-	-	-	-	-	-	\$33 75
Westminster, . . .	-	52	48	24	-	-	24	-	-	24	-	242 22
Wilbraham, . . .	-	-	23	-	-	-	-	-	-	-	-	136 31
Wilmington, . . .	-	12	40	-	1	-	-	18	-	34	-	187 38
Windsor, . . .	-	-	30	-	-	-	-	-	-	-	-	150 00
Wrentham, . . .	-	12	12	-	4	-	-	-	-	-	1 ¹	210 10

¹ One-horse.

TOWNS RECEIVING FIRE-EQUIPMENT REIMBURSEMENT DURING YEAR 1912.

Acushnet,	\$143 22	New Braintree,	\$76 87
Ashby,	34 50	Norwell,	193 87
Auburn,	210 00	Pelham,	36 00
Avon,	9 90	Petersham,	202 55
Bedford,	28 75	Raynham,	172 23
Bellingham,	67 22	Rehoboth,	250 00
Berkley,	144 00	Richmond,	56 20
Berlin,	241 45	Royalston,	98 25
Blandford,	59 80	Rutland,	250 00
Boxborough,	90 00	Shelburne,	4 37
Boylston,	76 20	Shirley,	139 50
Brimfield,	99 75	Stow,	131 31
Chatham,	6 45	Sturbridge,	116 45
Dighton,	50 00	Sutton,	188 46
Erving,	75 00	Wales,	236 77
Freetown,	72 62	Westminster,	186 31
Georgetown,	43 50	Wilmington,	146 21
Gill,	65 00	Windsor,	150 00
Greenwich,	34 50	Wrentham,	210 10
Halifax,	205 91	Total,	\$4,989 99
Harvard,	201 52	Unexpended balance,	10 01
Holbrook,	24 00	Total appropriation,	\$5,000 00
Lynnfield,	86 25		
Merrimac,	75 00		

While the work of this branch of the department has progressed fairly well, it is by no means up to the standard. It is necessary that we have at least twelve substations in order to completely cover the State during hazy and smoky weather. We must have better fire-fighting organizations in many of the towns. Our forest wardens and their deputies must be men who have the faculty of handling men; they must be experienced in fighting forest fires; they should have telephone communication, so that observers can get them promptly in case of fire. Nearly all forest wardens are paid only while actually employed, and in ordinary years this means a very small remuneration. In order to secure good, desirable, efficient men they must be paid. The type of man needed has the ability

and energy to make more in some occupation, and he cannot afford to give his services or neglect his business at times for a few days' work. There are cases where men are doing such service because of their interest in the forests, but there is no good reason why a capable forest warden should not be paid as generously as any town officer.

Forest wardens should be provided with modern fire-fighting equipment. At least one-half of the towns within this Commonwealth have no equipment whatever for handling fires, and until the selectmen and residents of such towns provide their wardens with suitable equipment, just so long will they have disastrous fires. City fire departments that have an appropriation covering only their building and city fires should not be obliged to expend a large part of this fund in fighting forest fires, but a special fund should be available for such fires, and in many cities the city fire department should have jurisdiction only within the city limits. A town forest warden should be appointed who should have jurisdiction over all fires outside the city limits, and he should be supplied with the most modern equipment. In this way we shall accomplish results. Some of the most serious and damaging forest fires we have had this summer have come under the supervision of city fire departments, and were absolutely uncared for.

Another trouble we have experienced is in fires occurring just over the town line. There should be no town lines in fighting forest fires.

Through the courtesy of Mr. L. A. Wells, observer in charge of the meteorological observatory at the Blue Hill Reservation, we are able to submit a table showing the precipitation for the years 1910, 1911 and 1912, and also the normal rainfall (see page 55). This table shows that the rainfall for 1912 is 7.36 inches less than in 1911 and 8.61 inches less than normal. It shows that during the months of March, April, May, July and August the precipitation was above normal, but the rainfall in June was 2.54 inches below normal, there being but .53 of an inch rainfall that month. During the months of September and October, the time when our dangerous fires are liable to occur owing to the leaf fall and to frosts that kill the vegetation, the rainfall was 2.61 inches below normal. Taking into consideration the scantiness of the rainfall and the fact that the majority of the observers are new to the work, we feel that the results obtained have been very gratifying.

Detailed reports received from the town forest wardens show that we have, in addition to the forest wardens in the different towns, 1,640 deputy forest wardens, 1,135 of whom have telephone communication with the observation stations. These reports show that our wardens have issued 16,851 permits for burning brush, fallow, etc. We have 317 portable sawmills in operation throughout the State, of which 61 are in operation in District 1, 22 in District 2, 137 in District 3, and 97 in District 4.

Statistics show that over 350,000,000 feet of lumber are being cut in Massachusetts annually. This, in addition to what is being used for railroad ties and in wood-using industries, will soon exhaust all merchantable

timber within the Commonwealth unless some drastic measures are adopted prohibiting the wholesale cutting of the same. It is not only a matter of removing the merchantable timber, but nearly every party carrying on lumbering operations leaves a dangerous fire slash which at some future time is sure to cause a disastrous fire. These slashes could be prevented and the fire danger lessened very materially if a slash law were enacted making it necessary that all such slash be removed or burned. Legislation should be enacted compelling the screening of all portable steam mills, donkey engines, steam rollers, steam shovels and all other coal-burning boilers and locomotives that are in operation in or through forest areas.

The comparative table on page 56 shows acreage burned, cost to extinguish and damage caused by forest fires throughout the Commonwealth for the past five years. While the loss has been reduced from \$537,749 for the year 1911 to \$80,836 for the present year, it is still greater than it would have been provided we had had efficient fire fighting in every town. With the exception of a very few fires, the principal damage was caused by not leaving sufficient help at the fires after they were supposed to be under control. Many fires were left at night uncared for, only to be sighted by the observer the following day, and before sufficient help could be procured the fire was again beyond control. Again, we lost heavily in the practice of back-firing, which seems to be the only means that some wardens have of handling fires. This is absolutely uncalled for unless in the case of a crown fire. As long as a fire is confined to the ground there is no sufficient reason why it cannot be extinguished without back-firing.

Nearly all our serious fires were confined to the eastern part of the State. We had no serious fires west of Worcester County, and the Cape country was without any damaging fires, as compared with previous years. The principal cause of fires in the Cape country in the past has been the use of defective locomotives. An effort has been made this season to overcome this trouble, special attention having been given to all locomotives running through the Cape country, with the result that very few fires have been started from this source.

The comparative table on page 56 shows that our losses were held very low until we experienced the severe drought during the month of October. While the month of June was exceptionally dry, with only .53 of an inch rainfall, our loss was held down to practically \$12,000. The most serious fires occurred between October 15 and October 23. On Sunday, October 20, we had 51 fires burning in nearly as many towns, this being the record day of the season. These fires were confined to Norfolk and Plymouth counties.

We have been extremely fortunate this year in obtaining reports of fires. We have been able to have reports of practically every fire that caused any damage of importance. This is undoubtedly due in a measure to a small fee we have allowed each warden for such reports. As is indicated by the table on page 56 these reports show that 35.1 per cent. of all the fires reported to this office were of unknown origin. Many of these were undoubtedly caused by people traveling along highways and through

the forests and carelessly tossing away lighted matches, cigar butts or cigarette stubs. Cleaning up the inflammable material along the highways would eliminate a large number of fires from this source. Although the percentage of unknown fires is less than last year, it is by no means satisfactory. Each town should pay its forest warden a suitable salary, so that he can afford to make a careful examination regarding the circumstances attending each forest fire in his territory.

Railroads still head the list in the percentage of known causes. It will be observed that the percentage of railroad fires has increased considerably over the figures for last season, but this is explained by the decreased percentage of "unknown" and "miscellaneous" fires. The total number of railroad fires is slightly less than last season.

Early in the spring this office distributed to the forest wardens throughout the State 12,000 cloth posters on which were printed extracts from the Massachusetts forest fire laws. These were posted in conspicuous places in the forest area of the different towns. Notwithstanding this extensive posting of the fire laws the table shows an increase in the number of fires caused by hunters, smokers or berry pickers, indicating an attitude of carelessness on the part of the general public which must be combated by educational work and by a more active prosecution of offenders.

Reports show the present permit law, which has been in operation for the past two years in over 220 towns and cities throughout the Commonwealth, to have given general satisfaction. This law applies to all cities and to such towns as have accepted it at any annual or special town meeting. Our reports also show that 16,851 permits have been issued this year, and that the percentage of fires caused by burning brush, etc., has been reduced from 16.2 per cent. in 1910 to 5 per cent. this year, which is without doubt due to the enforcement of this law. There being less than 25 towns that have not accepted the act, it seems necessary that legislation be enacted making this law uniform throughout the State, thus eliminating the considerable dissatisfaction which has arisen in some parts of the State over the unequal application of the law.

The law relative to the appointment of forest wardens should be amended, allowing the appointment of such forest wardens to be made in January each year instead of in March or April, as it now is. Inasmuch as our fire season is at hand the first of March in ordinary years, the appointment of our men coming at that time allows us no opportunity whatever for perfecting our organization and instructing any new men who may be appointed. We are also unable to have a correct list of all forest wardens and their deputies for the use of our observation men until after the fire season is well advanced. By allowing the mayors and selectmen to make their appointments in January, we would have sufficient time to complete our organization and be in readiness for handling spring fires.

I am very much in favor of legislation being enacted this winter allowing the State to assume one-half the expense of fighting forest and brush

fires in all towns with a valuation of less than \$2,000,000. While this means an additional appropriation by the State of from \$7,000 to \$10,000 each year, I feel that the results obtained would fully justify the expenditure.

It is needless to point out the value of the forests of a State to the people of that State as a whole, as distinguished from the citizens of the separate towns, for in many cases the products of these woodlands are not consumed within the towns themselves wherein they grow, but are used directly by the cities which have no forest area. This being the case, the welfare of the forest should be the interest of every citizen in the Commonwealth. In view of this, one of the chief defects of our present method of protecting the forests has been that we have left it wholly in the hands of the individual towns, without responsibility to any single head. This defect, of course, has been partly remedied by the organization of this branch of the department, and the benefits resulting therefrom are, we believe, already apparent. In many ways, however, the hands of the State Fire Warden, working through his deputies, are still tied, for while it is possible for him to devise many ways wherein towns may co-operate with each other and with his deputies, it is often impossible to properly carry out these plans because of the inability of the State under the present law to guarantee any substantial remuneration. Any business man will realize the futility of expecting satisfactory service for nothing, and the case of the State does not differ; in fact, we are constantly surprised at the amount of time and labor that have been given gratis in the past by our wardens. The zeal of a few wardens, however, cannot offset the carelessness of many. Furthermore, unpaid labor is usually spasmodic, and for these reasons the efficiency of the service as a whole deteriorates rather than increases under such a system.

It will be necessary to mention only a few ways in which the control established under a system of part payment of fire-fighting expenses by the Commonwealth would increase the efficiency of the fire-fighting service. A uniform rate of pay for all fire fighters could be put into effect, thus doing away with the disadvantage of having a difference in wage of from 10 to 20 cents an hour in adjoining towns, a condition which now exists and which has produced much discontent and inefficiency. Again, it would be possible to pay the local warden in each town an amount in some degree commensurate with his services, a state of affairs which does not now obtain in many cases.

The number of towns covered by the plan outlined above would be 194, as against the 172 covered under the present fire-equipment act, which is limited to towns having a valuation of \$1,500,000 or less; and it is to be especially noted that the area occupied by these 194 towns comprises 80 per cent. of the woodland area of the State. That such a proposition is not an experiment is borne out by the fact that nearly all the eastern States are working under similar laws under which the State pays a fixed proportion of the fire-fighting cost (in most cases one-half), and thereby

obtains a better grade of men and of work than was formerly possible. That such results would be obtained here cannot be doubted, especially in view of the success of the present reimbursement act elsewhere referred to.

Aside from the above financial considerations, the value of our woodlands in other ways makes their protection imperative. No forester, and, for that matter, no person of ordinary powers of observation who has given any thought to the subject, can doubt the value of woodland as a retainer of the soil, a regulator of the stream flow, a cover for game, and a pleasure resort for the people. For these reasons alone, if the timber had no financial value, the woodland should be preserved. This has been said so many times as perhaps to weaken its force, but the observer-need only look at such countries as France and China to be convinced of its truth; and the time is coming, and it is not far distant, when the people of the State will learn to use the woodland more and more as a place of recreation, as is the custom in foreign countries like Germany, where the tired city dweller takes his family with him to spend his holiday in the woods, and returns invigorated and refreshed.

Respectfully submitted,

M. C. HUTCHINS.

State Fire Warden.

BOSTON, MASS., Nov. 30, 1912.

SUGGESTED CHANGES IN TREE WARDEN LAW.

The time is here, it is believed, when our cities and towns can ill afford not to have a trained man in their employ who has a practical working knowledge of forestry. We have been improving our conditions year by year. The old fire ward plan has been changed to the present forest warden system, and the local moth superintendents' work has been systematized so that it is improving each year. It now remains to readjust our tree warden law so that a trained man may be appointed who will be held responsible for getting results. There is no intention of casting any reflection upon the present tree wardens, as they have in most cases had little or no money to do with, and towns and cities have shown indifference to the position. There is also confusion in the minds of many between the duties of forest warden, moth superintendent and tree warden, which is perfectly natural. Many towns feel that the tree warden, by virtue of his election, must have the moth work to superintend, regardless of whether he has abilities in that direction or not. These misunderstandings have been unfortunate, for in order to get best results the work should not only be well done but should also



A hardwood growth that has been thinned and treated for gypsy and brown-tail moths. Note how white pine has seeded in. This is an example of how pine can be encouraged to supplant other species. Pickman estate, New Bedford.



A view of a road through North Shore woodland where the hardwoods have been cut out to eliminate the ravages of the gypsy moth.

run smoothly. The very fact that the tree warden is an elective office, and that there is frequent rivalry for the place, engenders feelings that are in themselves antagonistic. The reason that the forest warden work is advancing so well and with so little friction is that the office is not in politics, but depends on merit. This is equally true of the work of the moth superintendent. Were we to make the tree warden also appointive by the selectmen instead of elective, there is every reason to believe that the whole forestry plan would result in better work and at less expense. There would be a tendency to amalgamate the three positions into one. This could be done now only that it often happens that the tree warden who is elected is not a man sufficiently experienced to get results. The three town offices are each of importance, but if properly systematized the work could be planned so that one well-trained man could handle all. The setting out and pruning of trees could be done at a time of the year when there is little to be done on moth work, and hence the two kinds of work, if combined, would give continuous employment, and naturally interest a more stable and efficient class of employees. These same men, being in steady employ, could be utilized as the active force for fighting forest or brush fires. With the work thus systematized I am confident our future conditions will be far more satisfactory.

GYPSY AND BROWN-TAIL MOTH SUPPRESSION.

The moth work has gone forward in a definite and systematic way and we have every reason to feel encouraged by the results. As stated under another heading, the State Forester is frank to say that the sooner we adopt scientific forestry methods just so soon will we take a forward step in their control. Ever since the work of moth suppression came under the control of this department it has been our constant aim to utilize forestry principles in combination with the other practices employed as the most effective method of getting results.

In the earlier days the moth problem was more confined to residential sections, and hence to parks, shade trees and shrubbery, and the methods of combating it were quite different from those at present in use. These insects now have spread out into the country, and the problem is one of fighting them under much more adverse conditions. Under city and village conditions

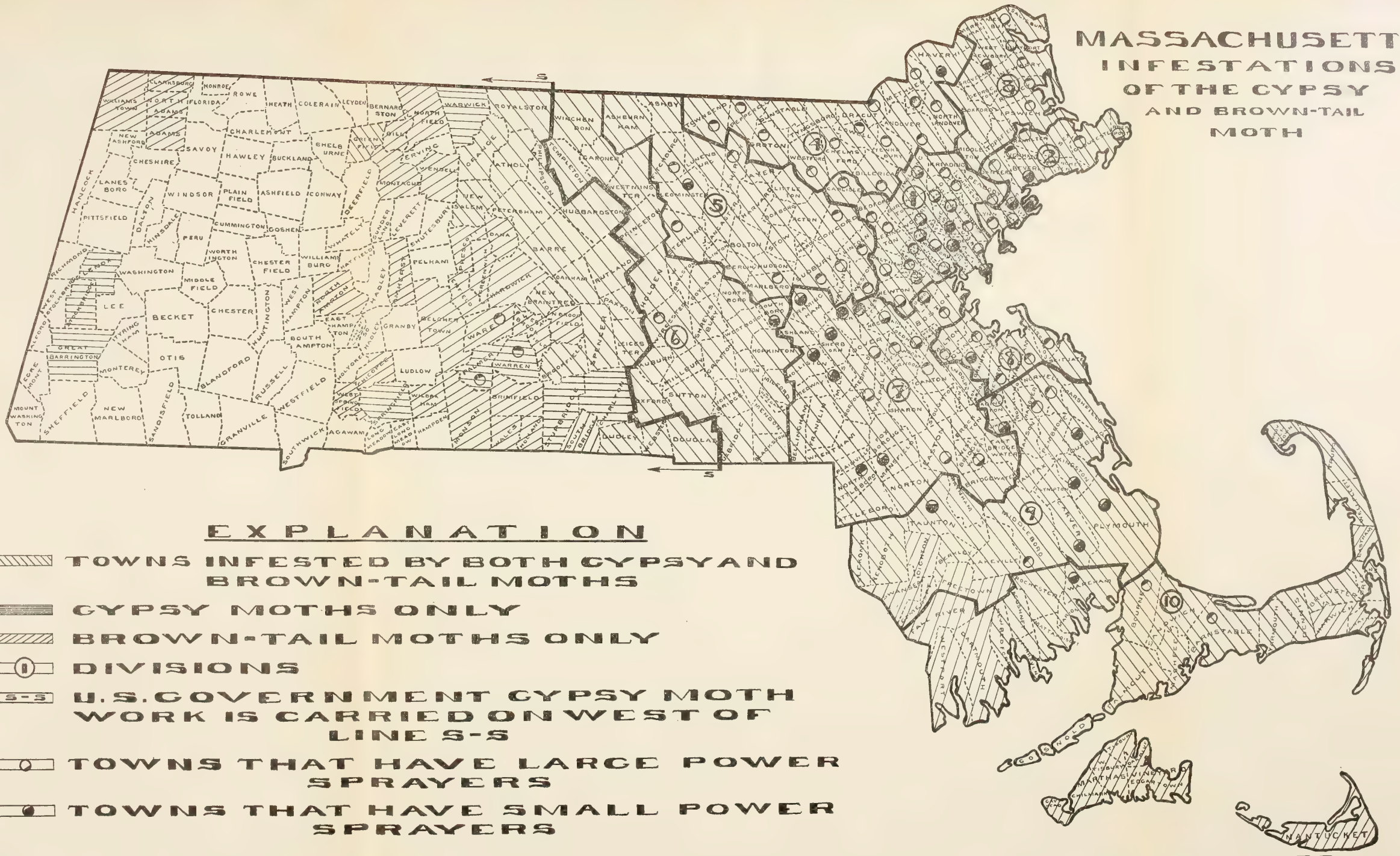
property is worth more and people are willing to expend more money to protect it; but when the moths spread out into the back wood lands, much of which is of extremely indifferent growth and in many instances comparatively worthless, the problem is quite different. The State law which gives protection in residential sections, requiring all property owners to pay in proportion to their valuation, ceases to be very effective when applied to cheap wood lands.

The problem of caring for residential conditions has been solved, and it is no more a perplexing question, for only in those cities and towns that are naturally nonprogressive in all their business relations is there likely to be any trouble. The purely country problem, however, is perplexing, and demands much more consideration. It has been the aim of the State Forester, therefore, to make the older sections, that have received assistance from the State for some time, assume the responsibility of self-support as rapidly as possible, so that the State's appropriation may be used where it is more needed, in the rural sections. In last year's report a brief account was published, so that no town could have an excuse for not knowing its conditions.

We have finally prevailed upon the federal government to assume the parasitic work, to which Massachusetts has contributed \$15,000 a year until this season, and at present the government is preparing to establish a belt or picket line (see accompanying map) along our outer border of infestation, with the purpose of preventing the insects from spreading further. Hereafter everything beyond this border will be government work. This plan was advocated by the State Forester three years ago, and it is believed that now, with a more definite policy, the outlook is very bright for future work. This arrangement gives Massachusetts a definite work to perform, namely, to improve her internal conditions.

The infestation of the gypsy moth is not as great as we approach the government picket line, as some of the towns just within this line have but few of the insects. It is nevertheless important that these towns receive early attention from an economic standpoint. It seems to be natural that newly infested towns are relatively indifferent at first, and also, the employees are untrained and unskilled. This, together with the fact that most

MASSACHUSETTS INFESTATIONS OF THE GYPSY AND BROWN-TAIL MOTH



STATE FORESTERS
OFFICE 1913

F. L. HAYNES

towns insist on employing home labor, accounts for the unsatisfactory conditions that follow the early work. This criticism is simply to point out what this department has to contend with. I realize that it is perfectly natural that town officials feel it is incumbent upon them to give employment to their own townsmen in preference to others, but in this case it would be better to import an experienced foreman, at least until such time as local men have become sufficiently trained.

The State Forester believes that in dealing with this moth problem it will be good business to keep up the work of the present with the idea of gradually placing the burden upon towns and cities.

In my last year's report a definite recommendation was outlined whereby the State appropriation should be lessened \$65,000 last year and \$50,000 each year thereafter for three years. I am still of the opinion that we should carry out that policy. Such a gradual curtailment on the part of the State would not interfere with the efficiency of the work.

In dealing with the moth problem I am frank to say that every endeavor is being made to impress our employees with the idea, already alluded to in another place in this report, that better forestry is the solution. This means that we are to change our point of view from a policy that is unpopular and expensive, although necessary, to a constructive one, namely, the conservation of our forests. What a showing could be made were we able to utilize the present expenditure in moth work for pure forestry! It is firmly believed that with a consistent policy we may attain that much-coveted goal.

The practice of furnishing with supplies in place of money the towns and cities that the State reimburses has been carried out for the past three years, with great economy to the State.

During the past season some readjustments have been made in the moth divisions. Three of the division superintendents were supplied with runabout automobiles in place of motor cycles, and this made possible their covering larger territories. The price of runabouts has now reached a point where they can be used economically.

PRIVATE PROPERTY WORK.

One of the most encouraging features of the year is the interest on the part of local superintendents in accomplishing as much work as possible that is self-supporting. A few years ago it was very easy for the public and private work to be so mixed that the cities and towns came to the State for a larger reimbursement than they should. Now we have a comprehensive knowledge of the area and the number of trees to be cared for in the cities and towns, and hence can estimate the approximate expense necessary to treat them. Once the strictly public work is planned for, the remainder of the trees in the city or town are cared for by the local superintendent at cost to the owner. This method has had a tendency to make individuals depend upon the town force to do their work, or have it done for them. The more private work that a superintendent can get done, the less the amount of future public work, since the one spreads to the other. The amount of private work accomplished in many places the past season is certainly creditable to the local officials in charge. In order to accomplish this work, as alluded to elsewhere in this report, equipment and trained, reliable employees are essential.

WORK ON STATE HIGHWAYS.

During the past year the moth work on the State highways has been done under the supervision of this department, and the expenses paid by the highway commission. Besides the gypsy and brown-tail moth work we also attended to the elm-leaf beetle spraying and did some improvement pruning. This work is usually done by our various local superintendents, under the supervision of this office. It is believed that the highway commission should be given a much larger appropriation for this and similar work. Next to good roads themselves, well-planted and properly cared for shade trees are appreciated by everybody; in fact, they make a country desirable to live in. In this connection I would suggest the advisability of making the town tree warden an appointive rather than an elective office, similar to the forest warden appointment, so that if a definite policy for setting out and caring for shade trees were outlined results would follow. At present, one town does well, while its neighbor may be indif-

ferent. The tree warden, since the position is an elective one, is also changed too often, and is usually given little financial backing.

Work has been done in the following cities and towns on the State highway, and paid for by the highway commission: —

Acton,	\$186 17	Methuen,	\$95 30
Amesbury,	56 28	Middleborough,	95 52
Andover,	85 63	Millbury,	47 50
Ashby,	21 75	Milton,	7 92
Ashland,	84 00	Newbury,	73 40
Attleborough,	34 90	Newburyport,	40 05
Barnstable,	150 00	North Andover,	150 60
Barre,	17 83	North Attleborough,	70 45
Bedford,	59 75	North Reading,	21 00
Beverly,	374 67	Northborough,	119 10
Billerica,	63 75	Norton,	45 70
Boxborough,	194 10	Norwood,	17 75
Brewster,	82 95	Orleans,	25 00
Bridgewater,	119 04	Pepperell,	81 41
Brockton,	63 13	Plainville,	23 90
Burlington,	61 00	Raynham,	13 00
Chatham,	25 00	Reading,	153 00
Chelmsford,	85 80	Rehoboth,	149 50
Concord,	507 94	Rockland,	82 35
Dennis,	57 40	Rowley,	85 71
Dighton,	114 35	Salisbury,	75 69
Dracut,	68 10	Scituate,	102 50
Duxbury,	13 80	Somerset,	198 75
Falmouth,	91 56	Sterling,	63 86
Fitchburg,	62 73	Stoneham,	100 80
Foxborough,	75 00	Sudbury,	139 90
Framingham,	55 62	Sutton,	10 75
Gloucester,	14 70	Swansea,	115 38
Grafton,	47 50	Taunton,	47 25
Groton,	120 85	Templeton,	67 25
Groveland,	71 10	Tewksbury,	99 27
Harvard,	63 98	Townsend,	274 50
Harwich,	25 00	Tyngsborough,	147 00
Haverhill,	149 74	Wayland,	61 75
Hingham,	21 63	Wenham,	136 96
Holliston,	180 62	West Bridgewater,	19 15
Hudson,	31 50	West Newbury,	154 90
Ipswich,	43 48	Westford,	123 00
Lakeville,	30 67	Weston,	113 30
Lancaster,	55 58	Wilmington,	22 80
Leominster,	35 25	Winchester,	265 91
Littleton,	61 95	Woburn,	92 20
Lowell,	28 34	Worcester,	18 92
Lunenburg,	60 19	Wrentham,	40 00
Mansfield,	19 64	Yarmouth,	150 00
Marion,	8 00		
Melrose,	78 60		
Merrimac,	63 70		
			<hr/>
			\$8,064 22

In the following towns work was done on the State highways under the direction of the State Forester's office, and paid for by the State Forester from the appropriation for the suppression of the gypsy and brown-tail moths:—

Abington,	\$19 25	Newbury,	\$55 08
Bedford,	27 17	Norfolk,	10 50
Bellingham,	12 90	North Attleborough,	3 00
Braintree,	38 00	Pembroke,	6 50
Cohasset,	32 72	Quincy,	12 00
Dover,	24 50	Randolph,	17 80
Duxbury,	8 04	Scituate,	88 74
Hamilton,	113 32	Shrewsbury,	272 50
Hanover,	24 18	Southborough,	30 62
Hingham,	85 00	Stoneham,	62 78
Kingston,	9 28	Stoughton,	41 00
Lincoln,	87 59	Weymouth,	138 61
Marlborough,	197 36	Wilmington,	48 44
Marshfield,	20 97	Winchester,	49 56
Melrose,	46 24	Woburn,	213 86
Millbury,	4 47		
Natick,	58 89		
			<hr/>
			\$1,860 87

PARASITE WORK.

REPORT OF DR. L. O. HOWARD, CHIEF OF THE BUREAU OF ENTOMOLOGY,
WASHINGTON, D. C.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY, WASHINGTON, D. C., Dec. 7, 1912.

Prof. F. W. RANE, *State Forester, 6 Beacon Street, Boston, Mass.*

DEAR PROFESSOR RANE:—In accordance with your request, I take pleasure in enclosing a report on the parasite work of this year, for inclusion in your annual report.

Yours most truly,

L. O. HOWARD,
Chief of Bureau.

Down nearly to the date when I submitted my last report to you, namely, Dec. 15, 1911, all of the work on the parasites of the gypsy moth and brown-tail moth had been carried on co-operatively between the State of Massachusetts and the Bureau of Entomology of the United States Department of Agriculture, and on the whole the expense of the work was about equally shared. The co-operation on this project between the State and the Department of Agriculture was in effect for about six years, and was thoroughly satisfactory. Without the assistance of the State the operations by the department could not have been carried on upon so large a scale as has been possible. The most cordial relations have

existed and the most perfect facilities have been offered to experts of the Bureau at the expense of the State. The growing importance of the work, and the urgent need for the diversion of all possible State funds to other aspects of the investigation, brought about a transfer, which was entered into Dec. 1, 1911, all of the parasite work being taken on by the Bureau. A number of State employees were transferred to the Bureau rolls, so that their previous training and experience were available.

In my report to you submitted December 15, I summarized most of the results of the year 1911, including many facts in addition to those contained in my annual report as Chief of the Bureau of Entomology, which considered matters only down to the 1st of July. Most of the material received during the latter part of the season of 1911 was wintered at the laboratory at Melrose Highlands, and during the spring of 1912 there was a good emergence of parasites, and several vigorous colonies were liberated. The parasite found by Mr. Fiske in Sicily in 1911, and of which 125,000 cocoons were sent over, survived the winter successfully in Massachusetts, and during May and the first half of June, 1912, about 12,000 adults were put out in the field. A species of *Apanteles*, which was received in small numbers, passed through the winter in good condition, and a small colony was placed out. Females of this species lay their eggs in small caterpillars, and the insect has now passed through a generation since it arrived in this country.

The egg-parasite known as *Anastatus bifasciatus*, a species having only one annual generation, and coming from both Japan and south Europe, has been breeding in practically all of the places where it has been colonized. It spreads very slowly, however, and it is necessary to make many plantings in order that it may become generally distributed. In some of the collections of egg masses, as high as 47 per cent. of the eggs were found to be parasitized. More than 700 additional colonies of this species were put out during the spring of 1912.

The Japanese egg parasite, *Schedius kwanæ*, has been increasing rapidly, has several generations each year, and the outlook for its perfect establishment is very favorable.

Never, however, under any circumstances, may we expect that these two egg parasites together will destroy more than 40 per cent. of the eggs, since they are confined in their operations to the upper layer of eggs in any given egg mass. A reduction of 40 per cent. in the eggs, however, will be a great gain.

The European *Calosoma* beetle has become thoroughly established, and has caused much destruction among gypsy moth caterpillars and pupæ. It has been found in numbers as far north as Portsmouth, N. H., and in practically all of the towns in New Hampshire south of a line drawn from Portsmouth to Lowell, Mass. Last year this species was found in only a single town in New Hampshire. In the central infested district in Massachusetts adults and larvæ of this species, both of which feed upon gypsy moth caterpillars and pupæ, were so common that they were ob-

served by many citizens, and many specimens have been found on the sidewalks in the suburbs of Boston, where they had been stepped upon by pedestrians.

The European Tachinid fly, *Compsilura concinnata*, was also very abundant this year, and did excellent work in the vicinity of Boston. From a collection of about 12,000 caterpillars made in Stoneham, Saugus and Melrose, Mass., it was found that over 25 per cent. were parasitized by this insect.

An unlooked-for development occurred during the summer when small gypsy moth caterpillars were found to have been parasitized by *Apanteles lacteicolor*, another introduced parasite. Previously, only a single cocoon had been collected, in the summer of 1911. During the summer of 1912 the parasitism of gypsy moth caterpillars by this insect has been found over a wide area, from as far north as Manchester, N. H., to Hudson, Marlborough, and towns in this vicinity in Massachusetts, and also in towns around Boston. On account of the difficulty of observing this species, it is probably safe to say that a large amount of beneficial work performed by it has escaped notice.

Some of the other parasites, such as the Tachinid, *Blepharipa*, are increasing, as has been demonstrated by the work done during the past year.

In several places in the area which was badly infested during past years, it is a fair estimate that 50 per cent. or more of the gypsy moth larvæ, pupæ and eggs were destroyed during the summer of 1911 by the parasites above mentioned. In other areas, farther from the centers of parasite plantings, of course, so good a showing was not made.

It should be stated that the wilt disease was present during the season of 1912 as heretofore. It was almost impossible to find an infested area where the disease was not present some time during the caterpillar season.

The present condition of the brown-tail moth indicates a greater measure of control by introduced parasites than ever before. During the spring of 1912 climatic conditions were such that the fungous disease which attacks this insect in early June did not develop to any marked extent in the region about Boston. The previous winter was very severe, and many collections of brown-tail nests were made to determine the number of caterpillars which died in the webs during the winter from cold weather or other causes. The records from Maine, New Hampshire and the western part of the infested area in Massachusetts showed that a far larger percentage of dead caterpillars were found in the webs than in the districts surrounding Boston. This being the case, one would naturally expect a large increase in the brown-tail moth infestation about Boston this autumn. The condition of infestation, however, is not nearly so great as would be expected, and, as the fungous disease worked to a very slight extent in this particular region, it is reasonably obvious that the parasites were largely responsible for the present decrease. Collections and recoveries from the field also showed that the species which were most abundant in this region last year were far more common in 1912. *Apanteles lacteicolor*,

Meteorus versicolor and *Compsilura* were very common and doing effective work.

The parasites of the brown-tail moth, referred to in last year's report have increased in spread over a much larger territory than last year. The trend of the dispersion has been in a north and northeast direction, and has followed the same general lines as the brown-tail spread. The Chalcidid parasite, *Monodontomerus æreus*, has been found beyond the city of Bangor, Me., and as far north as the brown-tail moth has spread in New Hampshire. In Massachusetts and Rhode Island the spread of this species very nearly covers the range of the brown-tail moth. The first of the brown-tail moth winter nests parasites to be found established in this country, and to which I have made frequent references in my reports to you, namely, *Pteromalus egregius*, has also showed a good increase and spread over the previous year.

In furtherance of the proposed study of European conditions, especially regarding parasitic control in Europe, Mr. W. F. Fiske, with two experts assistants, was located in south Europe during the winter, spring and early summer.

It is especially encouraging to note that over a considerable territory centering a little to the northward of Boston, in which a greater variety of parasites are established in greater abundance than elsewhere, the effects of their importation are already noteworthy. It is safe to say that, on the most conservative estimate, 50 per cent., or one out of every two eggs, caterpillars or pupæ of the gypsy moth, was destroyed by imported parasites in 1912.

PRESENT STATUS OF THE WILT DISEASE OR "FLACHERIE."

When one reflects upon the tremendous capacity of the gypsy moth for causing damage to woodlands and shade trees, and fully realizes the vast amount of money which has been expended by Massachusetts in her efforts to suppress it; and moreover, as it is obvious that the spread of the moths over thousands of square miles, in many sections of which it is still abundant, justifies the belief that we shall be compelled to continue the fight against it indefinitely, unless more effective methods than those now employed are discovered, the State Forester's position easily may be understood in attempting to utilize anything which offers reasonable hope of effectiveness. In former reports reference has been made to the experimental work with the "flacherie" or wilt disease, which has been carried on under the direction of Dr. W. M. Wheeler of the Bussey Institution of Harvard University. The experiments were continued during 1912, and owing to improved facilities for developing it a greater number of plantings of the

material were made than in any previous year. In fact, the disease has now been distributed over the entire moth-infested area of the State. In view of the fact that the results of this planting are still problematic, it does not seem advisable to persevere in this work. Further investigations show that our knowledge of the disease is still fragmentary, and we must wait further development before expending more money. The experimental and scientific side of the work is now being prosecuted systematically by the United States Bureau of Entomology and by Harvard University in co-operation. We append a letter recently received from Professor Wheeler of the Bussey Institution of Harvard University which explains more fully the feeling among scientists in regard to the probability of success in attempting to spread wilt disease of the gypsy moth artificially. Professor Wheeler is not alone in his opinion, for it is shared by the most celebrated scientists abroad and by many prominent entomologists here in Massachusetts.

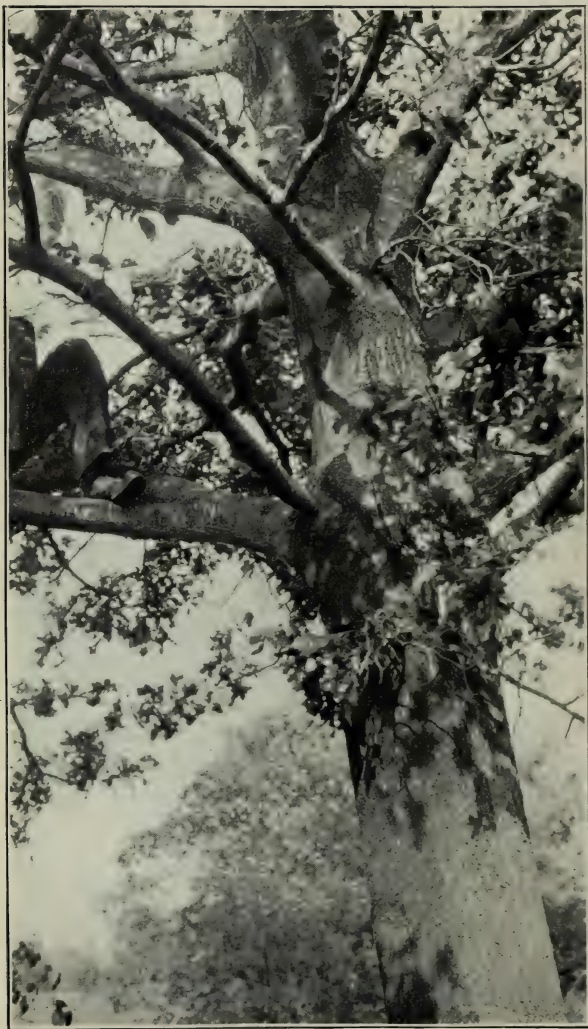
“FLACHERIE” OPINION OF PROFESSOR WHEELER.

BUSSEY INSTITUTION, FOREST HILLS, MASS, NOV. 20, 1912.

MR. F. W. RANE, 6 Beacon Street, Boston, Mass.

MY DEAR MR. RANE:—In obedience to your request I beg leave to submit to you my opinion in regard to continuing the practice of attempting to spread the wilt disease, or “flacherie,” of the gypsy moth caterpillars by artificial means in the forest lands of eastern Massachusetts. It is obvious that any attempt thus to utilize the wilt disease in practice must be based on a precise knowledge of the methods whereby the disease may be contracted by healthy caterpillars. Although we have good evidence for believing that the disease may be contracted by healthy caterpillars that have fed on the excretions of diseased caterpillars, or the deliquesced portions of caterpillars that have died of the disease, we have at present no data to prove that the disease can be transmitted from diseased to healthy caterpillars by mere bodily contact or by germs borne through the air. Many experiments have been performed for the purpose of proving the method of transmission last mentioned, but these, in my opinion, have given merely negative or highly equivocal results, owing to the fact that the disease, in a mild or latent form, is chronically, and perhaps hereditarily, present in practically all the localities in which the caterpillars occur in eastern New England. The acute and economically important phase of the disease may, therefore, arise through unusual meteorological conditions, or through peculiarities of the plants on which the caterpillars happen to be feeding. Hence, there is no advantage in





A photograph showing millions of dead brown-tail larvæ on the under part of the limbs, as the result of a single planting of the fungous disease.

continuing such experiments till the precise methods of infection and of its specific organism have been determined by carefully controlled laboratory experiment and protistological investigation. Such investigations are being pursued, with improved facilities, by the federal Entomological Bureau in co-operation with the Bussey Institution of Harvard University, and may be expected to yield, in the not too distant future, some adequate theoretical basis for a sound practical utilization of the disease in the field.

Very sincerely yours,

W. M. WHEELER,
Professor of Economic Entomology.

THE FUNGOUS DISEASE OF THE BROWN-TAIL AND GYPSY MOTHS.

The same co-operative arrangements, as heretofore, were made with Harvard University, through Dean W. C. Sabine and Dr. Roland Thaxter, for carrying on this work. Mr. R. H. Colley was in charge assisted by some of our regular employees when occasion demanded it. The work was carried on at the Harvard Botanic Gardens, and we are greatly indebted to Harvard University for the use of their greenhouse and cold frames as well. The following report by Mr. Colley explains itself: —

Planting was commenced on the 6th of May, a week later than in previous seasons, on account of the late start of the larvæ in the field and general cold weather conditions, and continued until the 6th of June. Mailing cases again were used for the distribution of the diseased caterpillars. In sending out the material it was planned to supply the different districts with infected larvæ on definite dates, to ensure, as far as possible, that the planting would be done immediately on receipt of the material. This scheme was adhered to, with few exceptions. Approximately 200 cases were shipped to State and town superintendents all over eastern Massachusetts. The division superintendents supervised the work in order to acquaint the town men with the proper methods of handling and planting the material. Besides this distribution about 100 cases were shipped to private individuals during the first week in June.

The results of nearly all of the plantings were very satisfactory. Inspection of the planted areas by local and division superintendents showed that the disease had materially decreased the number of larvæ, and in some cases had killed practically all of them. Some failures were reported, which were undoubtedly due to delay in transit or material sent out when the infection in the disease boxes was low. Viewing the work as a whole, the season may be said to have been very successful. The results certainly seemed to indicate that a more extensive planting of the fungus would be even more effective in reducing the numbers of the caterpillars.

To carry on the work properly a breeding and infection house is needed in which light and heat can be well regulated. A good supply of clean dry nests for cold storage is also absolutely necessary. This supply should be large enough to furnish caterpillars for running at least twenty-four disease boxes, a number which ought to yield enough diseased larvæ to supply every infested town in the State. To feed such a large number of caterpillars some arrangements should be made for procuring a sufficient quantity of willow and cherry twigs, or for the cultivation of raspberry bushes, which yield tender leaves especially suited to the needs of the very young larvæ. Success depends on a large quantity of well-infected material which can be rapidly transported to the field. If this material is quickly and properly planted, there can be no question as to its effectiveness in destroying the brown-tail caterpillar.

It was impossible to run the brown-tail fungus through the summer in the disease boxes, on account of the lack of a proper supply of larvæ in cold-storage, but the infection was successfully started from diseased webs during the first week in September.

In the case of the experiments with the gypsy fungus the results were not satisfactory. The larvæ did not thrive well in the breeding boxes, because the conditions in the boxes, where warmth and moisture were at an optimum for *Entomophthora*, were extremely favorable for the development of wilt, and the caterpillars died from this disease before the fungus could spread. Another factor which makes the propagation of the disease difficult is the apparent low virulence of the species which attacks the gypsy moth. Only one planting was made, at Stony Brook, about the 25th of June. Inspection ten days later resulted in the finding of one dead caterpillar, on a small branch about five feet above the bag in which the diseased larvæ had been planted. No other evidence of the fungus could be found. That the gypsy fungus will prove as destructive as the brown-tail fungus seems, in view of the negative results so far obtained, to be very doubtful, but there is a possibility that it may get started from some of its numerous resting spores which must be in the field in localities where the fungus was planted, in which case its effectiveness might prove to be greater than our experiments would indicate.

QUARANTINE AGAINST THE GYPSY MOTH AND THE BROWN-TAIL MOTH.

As a result of a hearing held at Washington, D. C., on Oct. 29, 1912, before the Federal Horticultural Board, the Department of Agriculture has established a quarantine against the above-named moths which took effect on and after Nov. 25, 1912. The regulations are as follows:—

*Gypsy Moth Regulations.*¹

Coniferous trees of the area quarantined for the gypsy moth, such as spruce, fir, hemlock, pine, juniper (cedar), and arbor-vitæ (white cedar), known and described as "Christmas trees," and parts thereof, and decorative plants of the area quarantined for the gypsy moth, such as holly and laurel, known and described as "Christmas greens or greenery," shall not be moved or allowed to move interstate to points outside the quarantined area.

Forest plant products of the area quarantined for the gypsy moth, including logs, tan bark, posts, poles, railroad ties, cordwood and lumber, and field-grown florists' stock, trees, shrubs, vines, cuttings, and other plants and plant products for planting or propagation, of the area quarantined for the gypsy moth, excepting buds, fruit pits, seeds of fruit and ornamental trees and shrubs, field vegetable and flower seeds, bedding plants and other herbaceous plants and roots shall not be moved or allowed to move interstate to any point outside the quarantined area unless and until such plants and plant products have been inspected by the United States Department of Agriculture and pronounced free from the gypsy moth.

*Brown-tail Moth Regulations.*¹

Deciduous trees or shrubs of the area quarantined for the brown-tail moth, or parts thereof, including all deciduous field-grown florists' stock, vines, cuttings, grafts and scions, shall not be moved or allowed to move interstate to points outside the quarantined area, unless and until such plants and plant products have been inspected by the United States Department of Agriculture and pronounced to be free from the brown-tail moth.

NORTH SHORE WORK.

The co-operative work along forestry and moth lines that has continued now for several years between the summer residents committees, the towns and the State Forester's department, has again been continued throughout the past season. The State Forester wishes to acknowledge the very public-spirited interest that has been shown generally in this work, and especially is he indebted to Col. Wm. D. Sohier for his unfailing support, which has made the work possible.

The following is a reproduction of that portion of the summer residents committees' report that relates to the moth and forestry work: --

¹ Blanks on which to make application for inspection or for permits to ship will be furnished upon request by the United States Department of Agriculture, 6 Beacon Street, Boston, Mass.

GYPSY MOTH AND ROAD WORK ON THE NORTH SHORE.

General Purposes.

This is the fifth season that your committees have been engaged in preserving the forests on the North Shore. Each year the work has been more and more consolidated for the purpose of preserving the woods directly back of the valuable shore property, and also for the purpose of preserving a strip 200 feet wide on the sides of our beautiful wooded drives.

The conditions in the woods as a whole on the North Shore are much better in 1912 than they have been at any time in the past.

The fact has been demonstrated beyond question that by thorough, systematic work the forests can be preserved, and we think improved as well. Half measures are merely a waste of money. The taking out of the poorer trees and of the dead wood will undoubtedly in a short time result in much better forests.

Scope of the Work.

Your committees have continued their policy of co-operating with subscribers who are doing thorough work, by endeavoring to give them a protective belt back of their estates.

We have now cleared up, creosoted and sprayed a strip 200 feet in width on the sides of all of the wood roads, — something over 30 miles, — besides caring for the woods on the sides of the main roads. The work has been done all the way from Beverly Hospital in Beverly, nearly down to the line of Gloucester harbor.

In the interior of the woods very little, if any, work has been done. While in many places there is a large number of dead trees, they are mostly the weaker trees, which could not stand one stripping, but it has seemed to the inspectors, and to the writer, after considerable exploring, that even in these woods the conditions are much better than they have been before.

The summer residents in Magnolia contributed nearly \$3,000, and we secured an equal amount from the State, but this year the city of Gloucester refused to contribute the \$2,500 which it had been contributing for the past two years.

The work of cleaning up the whole block on the east side of Greenwood Avenue is nearly completed, so that Pride's Hill, with its beautiful woods, will be preserved. They were in very bad condition.

Parasites.

More parasites were planted again this year, and I think the conditions in the back woods indicate clearly that the parasites have been increasing. We also put out a large number of diseased caterpillars and flacherie, or the so-called "wilt disease." This latter was effective in many places.

While it will be several years before the parasites, that attack the moth in all the stages of its growth, will be thoroughly developed, they will certainly render substantial aid in the back woods.

One of the cheapest and most effective methods of preserving the woods, and reducing the cost of the work, is to cut out all the trees, like the white oak, etc., which are particularly infested by the gypsy moth, and leave only the more resistant trees, such as pines, hemlocks, beeches, etc. We are doing this wherever we can, and the results are excellent. If one can cut all the white oaks, even, it will add greatly in reducing infestation, and make the work much easier and less expensive.

Future Work.

It seems as if in the future we could, to a certain extent, curtail the amount of work that is to be done where the woods are not of any great public value, and we are doing the work merely to preserve the forests which can be seen and the private estates. In some colonies it will be possible to get along with merely creosoting for one year, and still keep the gypsy moth under control; in other colonies we can spray and do no other work. It is possible, in a few of the back colonies, that we can work only alternate years, and still prevent the gypsy moth from increasing.

Work done.

We exceeded all former records this year, partly because we were favored with good weather, but principally because of the increased efficiency of our men and our spraying machines.

There were 3,774 acres sprayed in twenty-three days. We had 13 power spraying machines actively at work, and 1 motor truck spraying machine. This truck took care of all the roadsides very much more advantageously, and for very much less money, than they had ever been cared for before.

We had only two serious breakdowns, but in each case the spraying machine was repaired over night and was working the next day. We are now organized so as to do our own work and repair our own machines.

To a large extent this increased efficiency was secured by employing a high-priced and competent mechanic, and by keeping the parts and supplies constantly on hand.

Your committees have adopted the policy of keeping enough of its more experienced men employed during the winter so that it will have efficient and competent foremen to direct the work the next year. This has proved a great economy.

When the work started, with the low-power spraying machines we could not throw to the tops of the trees. It was then considered a good day's work when a gang of 11 men and 1 power sprayer sprayed 5 or 6 acres a day. This year it was no unusual occurrence, where conditions were favorable, for one of the new machines, with the same number of men, to spray 18 acres a day.

The average acreage sprayed by each machine this year was something over 12 acres per day for the whole twenty-three days. We sprayed on an average 164 acres a day.

Plant.

Your committees have now 1 automobile truck equipped for spraying, 12 modern power-spraying machines, 3 auxiliary pumps, 1,000 feet of hose with each spraying machine and with each pump, and 2 watering carts.

This year we bought 1 new sprayer and rebuilt 3 of the old ones, making them as good as new. We have still two or three machines which are two and three years old, which will probably be sold.

Persons in Charge of the Actual Work.

The actual work was in charge of the State Forester's department, under Mr. F. W. Rane. Mr. George A. Smith, gypsy moth superintendent supervised the work, and was extremely efficient and interested. Locally, the work was in charge of Mr. Saul Phillips, who has been in charge practically ever since the work started, five years ago. He had with him his assistant, Mr. M. H. Donovan.

Your committees arranged that, in order to secure efficient inspection and rapid repairs, Mr. Phillips should have an automobile and Mr. Donovan a motorcycle. Your committees feel that we owe a great deal to these gentlemen and their able foremen for their tireless labors, especially during the spring season.

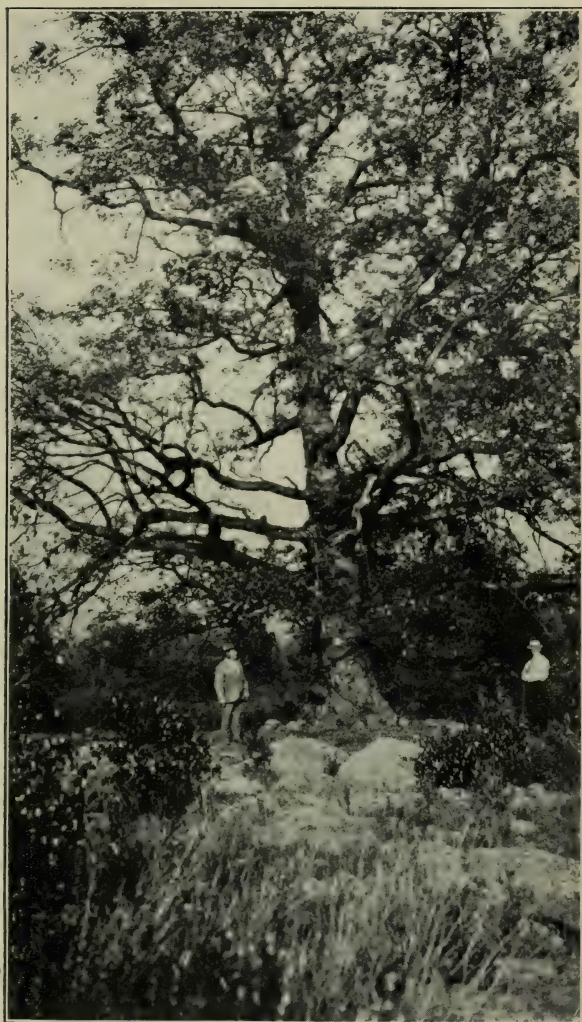
Under the State law it is doubtful whether it was legal for the men to be employed more than eight hours a day. The men desired to work more, and would have left us if they had not been allowed to work more hours, because they wished to secure the additional pay. Consequently, your committees arranged so that the men worked for the State eight hours a day, and your committees employed them and paid them at the same rate for the additional hours they put into the work, thereby securing the best results.

It seemed to your committees that the authorities should have ruled that this was emergency work, as it was evident that curtailing the hours would mean that 30 less acres would be sprayed each day and that the moths would be allowed to destroy the woods on that much territory, or at any rate seriously injure them, and of course it is clearly evident that 30 acres a day less for the twenty-three days would mean that the moths would have been allowed for that thirty days to defoliate some 690 acres of woods.

We hope that some legislation will be passed this year which will help the matter and exempt spraying, at least, from the eight-hour law.

How the Money was Secured.

Governor Foss early in the year agreed that the State would co-operate in 1912 as it had been doing ever since 1908. The State Forester's department took charge of the whole work. The following appropriations were secured: —



A mammoth pasture oak that was badly infested with gypsy moth egg clusters. This photograph was taken at the end of the feeding season, showing how the foliage has been maintained; the only treatment was the banding of the trunk with tanglefoot.

Commonwealth of Massachusetts,	\$22,500 00
City of Beverly,	5,000 00
Town of Manchester,	5,000 00
Contributed by your committees,	23,000 00
Collected from private owners for work done on the woodland,	4,360 77
	<hr/>
	\$59,860 77

This money was all paid into the State treasury for moth work on the north shore, to be used by the State Forester's department.

His Excellency Governor Foss has at all times been interested and ready to co-operate with the efforts of your committees. Had it not been for this co-operation our forests would undoubtedly have been destroyed.

Expenditures.

According to the report of the State superintendent, the expenditures were as follows: —

From July 16, 1911, to July 30, 1912,	\$55,453 94
Tools and supplies bought for 1911 work,	18,520 89
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Balance,	\$36,933 05
Due for tools and supplies, 1912 work,	13,516 75
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	\$50,449 80
Less value of tools and supplies on hand,	13,421 84
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Actual cost of the work done by State,	\$37,027 96
Overtime paid by committees,	974 02
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Total cost of work, not including plant,	\$38,001 98

Details of Cost of the Work.

Spraying,	\$17,328 56
Cutting and burning,	13,251 67
Creosoting,	6,316 13
Tanglefooting,	744 60
Leopard moth work,	238 29
Road repairs,	73 10
Replanting wilt disease,	49 63
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	\$38,001 98

The Work accomplished.

Roughly speaking, about 1,000 acres of woodland were cleared and sprayed in 1908, about 2,100 acres in 1909, about 3,000 acres in 1910, about 3,200 acres in 1911, and over 3,600 acres in 1912.

The cost of the work was approximately as follows: —

1,000 acres in 1908,	\$60,000
2,100 acres in 1909,	60,000
3,000 acres in 1910,	57,000
3,200 acres in 1911,	54,500
3,600 acres in 1912,	38,000

The acreage cared for in 1912 was three and one-half times that cared for in 1908, and the expenditure only three-fourths as much.

We also did some fall spraying in the fall of 1911 for brown-tails on 162 acres. Our force varied from 25 men to over 150.

Average Cost of the Work.

Spraying 3,774 acres,	. . . . .	\$4 59 per acre.
Creosoting 2,744 acres,	. . . . .	2 30 per acre.
Cutting 1,368 acres,	. . . . .	9 68 per acre.

These costs do not include tools, plant, etc., nor depreciation, merely labor and materials.

Where work was done on private estates, which was only in the back woods where it came in connection with other work your committees were doing, the cost of the work is being repaid by the owners whenever they can afford to pay for it.

Co-operation by the Commonwealth and the Cities and Towns.

Your committees feel that the summer residents owe a great deal to Governor Foss and his State officials, the State Forester, superintendent and men in charge of the work, to the mayor and city government of Beverly, and to the selectmen of Manchester, for their generous help and co-operation, without which it would have been impossible for your committees to have done systematic, thorough and efficient work against the gypsy moth under one responsible head, and without regard to town lines. The selectmen of Hamilton have also co-operated by caring for many of the woods in that town. Without this co-operation and the money given by the State, municipalities and subscribers, our forests and beautiful shore would have been greatly injured.

It requires a large amount of pluck, as well as sound business judgment on the part of city and town officials in these days, to authorize the spending of money in their charge by an outside committee or commissioner, or by others than town and city officials. We believe, however, that the results obtained are ample justification of their action.

Our Hopes for the Future.

Our forest can be preserved, our wood roads protected and the shore remain as beautiful as it is now, provided the work is continued on the lines on which it has been begun.

It is the opinion of the best experts that in the back woods the various parasites will soon maintain a kind of equilibrium which will prevent the trees which are yet particularly susceptible to the attack of the gypsy moth from being destroyed.

Your committees hope that the subscribers, the Commonwealth and the cities and towns will co-operate in the future as they have in the past. They hope that every resident and summer resident on the North Shore

who has enjoyed our woods, our trees and our dustless roads, and who has not yet subscribed, or who has not yet given his fair share towards the cost of this work, will co-operate by sending a check to Wm. D. Sohier, agent, 15 Ashburton Place, Boston, Mass.

A list of the subscribers is published herewith.

WM. D. SOHIER,
For the Committees.

Beverly.

OLIVER AMES.
CHARLES H. TYLER.
WM. D. SOHIER.

Manchester.

MAJ. HENRY L. HIGGINSON.
GARDINER M. LANE.
GEORGE WIGGLESWORTH.

Summer Residents Committees.

SUBSCRIPTIONS FOR GYPSY MOTH WORK ON THE NORTH SHORE, 1912.

Beverly.

Henry C. Frick, . . .	\$2,000 00	Mrs. E. C. Swift, . . .	\$150 00
Hon. Wm. H. Moore, . . .	1,000 00	Mrs. John S. Curtis, . . .	150 00
W. S. and J. T. Spaulding, . . .	500 00	Philip S. Sears, . . .	150 00
Mrs. Chas. H. Dalton, . . .	400 00	F. J. and Alice Cotting, . . .	125 00
Mrs. R. D. Evans, . . .	300 00	George S. Mandell, . . .	100 00
Dudley L. Pickman, . . .	300 00	F. I. Amory, . . .	100 00
Hon. Wm. C. Loring, . . .	250 00	Allen Curtis, . . .	100 00
Charles H. Tyler, . . .	250 00	Franklin Dexter, . . .	100 00
John L. Saltonstall, . . .	250 00	Harold J. Coolidge, . . .	100 00
Robert S. Bradley, . . .	250 00	Mrs. John A. Burnham, . . .	100 00
Francis Bartlett, . . .	250 00	Mrs. E. P. Motley, . . .	100 00
William Endicott, . . .	250 00	The Misses Paine, . . .	100 00
Alexander Cochrane, . . .	250 00	A. Shuman, . . .	100 00
Amory A. Lawrence, . . .	250 00	Augustus P. Loring, . . .	100 00
Henry F. Sears, . . .	250 00	Miss Frances R. Morse, . . .	100 00
Herbert M. Sears, . . .	250 00	The Misses Loring, . . .	100 00
Miss Fannie P. Mason, . . .	250 00	Mrs. G. H. Shaw, . . .	100 00
Frederick Ayer, . . .	250 00	George A. Goddard, . . .	100 00
Robert Saltonstall, . . .	250 00	Bryce J. Allan, . . .	100 00
Estate of Quincy A. Shaw, . . .	250 00	Col. C. L. Peirson, . . .	100 00
D. Herbert Hostetter, . . .	250 00	Messrs. A. B. and T. Silsbee, . . .	100 00
Henry Clay Peirce, . . .	250 00	Mrs. James F. Curtis, . . .	100 00
Mrs. H. P. McKean, . . .	250 00	Frederick R. Sears, . . .	100 00
Chas. H. Tweed, . . .	250 00	Miss Katherine Silsbee, . . .	100 00
William Phillips, . . .	250 00	Hon. Geo. H. Lyman, . . .	100 00
F. L. Higginson, . . .	250 00	Mrs. John C. Phillips, . . .	100 00
Wm. A. Slater, . . .	250 00	Mrs. Guy Norman, . . .	100 00
Oliver Ames, . . .	250 00	Horace D. Chapin, . . .	50 00
Charles D. Sias, . . .	250 00	C. K. Cummings, . . .	50 00
Wm. D. Sohier, . . .	250 00	O. W. Holmes, . . .	50 00
Thos. P. Beal, . . .	200 00	James L. Paine, . . .	50 00
Cranmore N. Wallace, . . .	200 00	Gordon Dexter, . . .	50 00
W. B. Thomas, . . .	200 00	Mrs. F. H. Peabody, . . .	50 00
Neal Rantoul, . . .	200 00	T. C. Hollander, . . .	50 00
S. Reed Anthony, . . .	200 00	A. C. Ratschesky, . . .	25 00
Mrs. N. W. Rice, . . .	200 00		
Henry P. King, . . .	200 00		
			\$15,150 00

Manchester.

Charles E. Cotting, . . .	\$500 00	T. Dennie Boardman, . . .	\$100 00
George R. White, . . .	500 00	Thomas B. Gannett, . . .	100 00
George N. Black, . . .	500 00	Richard H. Dana, . . .	100 00
Mrs. R. C. Winthrop, . . .	250 00	Executors of Myron C. Wick, . . .	100 00
Mrs. Chas. S. Hanks, . . .	250 00	T. Jefferson Coolidge, . . .	100 00
George Wigglesworth, . . .	250 00	William Hooper, . . .	100 00
Gordon Abbott, . . .	250 00	Amory Eliot, . . .	100 00
Edward S. Grew, . . .	250 00	J. L. Thorndike, . . .	100 00
Henry L. Higginson, . . .	250 00	S. Parker Bremer, . . .	100 00
Gardiner M. Lane, . . .	250 00	Richard Stone, . . .	50 00
Wm. B. Walker, . . .	250 00	Mrs. Geo. D. Howe, . . .	50 00
Mrs. Henry S. Grew, . . .	250 00	The Misses Bartlett, . . .	50 00
Mrs. James McMillan, . . .	250 00	Roland C. Lincoln, . . .	50 00
Lester Leland, . . .	250 00	Mrs. S. V. R. Crosby, . . .	50 00
Walter D. Denegre, . . .	250 00	The Misses Sturgis, . . .	50 00
Harrison K. Caner, . . .	250 00	William L. Putnam, . . .	50 00
Mrs. W. Scott Fitz, . . .	250 00	Alex. S. Porter, Jr., . . .	50 00
Francis M. Whitehouse, . . .	250 00	Mrs. Greeley S. Curtis, . . .	50 00
Mrs. Mary L. Blake, . . .	200 00	Wm. A. Tucker, . . .	50 00
Mrs. J. L. Bremer, . . .	200 00	Mrs. James T. Fields, . . .	25 00
T. Jefferson Coolidge, Jr., . . .	200 00	Russell Tyson, . . .	25 00
Miss Amy Curtis, . . .	200 00	Nelson S. Bartlett, . . .	25 00
Mrs. Charles P. Hemenway, . . .	150 00	J. H. Storer, . . .	10 00
Robt. T. Paine, 2d, . . .	150 00	Lee, Higginson & Co. (vari-	
Samuel Carr, . . .	100 00	ous contributions), . . .	299 16
Dr. R. H. Fitz, . . .	100 00		
S. H. Fessenden, . . .	100 00	Total, . . .	\$8,434 16

Magnolia.

John Hays Hammond, . . .	\$500 00	Mrs. R. McM. Colfelt, . . .	\$100 00
John T. Morse, Jr., . . .	400 00	George A. Upton, . . .	75 00
Wm. H. Coolidge, . . .	250 00	George E. Carter, . . .	50 00
Miss E. G. Houghton, . . .	250 00	Mrs. Charles H. Bull, . . .	50 00
Miss Faulkner, . . .	200 00	Mrs. D. P. Williams, . . .	50 00
Oceanside Hotel, . . .	200 00	Mrs. I. Theodore Heard, . . .	50 00
George F. Willett, . . .	200 00	Charles S. Penhallow, . . .	25 00
James S. Lee, . . .	150 00	Georgina Lowell, . . .	25 00
Edward C. Richardson, . . .	100 00	Mrs. A. S. Covell, . . .	10 00
William R. Nelson, . . .	100 00		
J. Harrington Walker, . . .	100 00	Total, . . .	\$2,985 00
Mrs. Mary D. Turnbull, . . .	100 00		

Wood Roads.

Miss Mary Curtis,	\$25 00
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SOUTH SHORE WORK.

Last spring it was thought that the towns and summer residents on the South Shore were to co-operate with the State, and carry on moth work similar to that in vogue on the North Shore for some years. In anticipation of this plan Mr. Walter F. Holmes,



The tree on the left is a sugar maple on a residential street, showing injury from teams and resultant decay. The tree on the right is the same, after treatment. The inside was hollow, but was filled from the two openings.

who has had much experience in the latter place, was transferred to Cohasset to superintend the work. For some reason the plans fell through, but it was thought best to keep Mr. Holmes in that section, and a new division was made there. From the year's work it is believed that the conditions are better than ever, although the results would have been much more satisfactory had the former arrangements been carried out.

CITY FORESTER.

The proper care of shade trees in our cities and towns is an economic question of great importance. While trees grow naturally throughout the State, and in the past they have needed little care, in recent years, due to many causes, they must be intelligently looked after if we expect to keep them healthy and vigorous. The importance of foreign depredations like insects and diseases has necessitated our having a knowledge of their habits and life histories as well as remedies for their control. The unbalancing of our conditions in cutting off forests, enlarging our cities and changing things generally in our development of the country are accountable for many of our troubles. The work of the Massachusetts Forestry Association, through its new endeavors in establishing branch organizations in different sections of the State and thereby stirring up new interest in the importance of better care of our trees, is resulting in the desire on the part of our people that more skill be employed. Secretary Reynolds has several competent men working in different sections along this line whose efforts are already showing good results.

Mr. W. W. Colton, a former employee of this department, has been city forester of the city of Fitchburg for the past two years, and as his accomplishments during this time have been extremely effective, I have prevailed upon him to prepare the following paper, believing it will prove of general interest: —

WORK OF A CITY FORESTER IN MASSACHUSETTS.

Most of our Massachusetts cities have had some individual or some department that has looked after the interests of the shade trees. A few have had a man who held the office of city forester, but whose duties were only to trim and plant shade trees. The gradual change in conditions in the past few years added many duties to the office of city forester, until now it is a much more difficult position to fill than previously. The modern

city forester must be a man of special training, equipped to handle not only the old work but all the forestry and arboricultural interests of his city, such as establishing a nursery in which to raise the trees to plant his streets with, looking after the health and preservation of the older trees of the city, and being able to advise the citizens about their properties from a commercial as well as an æsthetic standpoint, and establishing and maintaining a municipal forest, the products of which will help run his department.

At the present time, however, the chief duty of a city forester is the care of shade trees. In taking over the position of forester in any city, the first duty is to obtain information in regard to his city and the condition of the trees there. To accomplish this he should first of all take a tree census, *i.e.*, all trees standing on public streets should be listed and a record of same kept at a central office for future reference. This work should be done as far as possible personally, as it gives him the personal acquaintance with his trees and their surroundings. After this information has been tabulated, and the forester has made himself familiar with his surroundings, his next step should be to get into the real work of putting the old trees into better condition, removing worthless specimens, and replacing and adding new trees to the streets. He should first of all obtain the services of a good active man of considerable experience in tree work to act as foreman, and then through this foreman put his own ideas into practice.

The question is often asked, "Why is it necessary to have a city forester at all? Why do we need to spend so much money on our shade trees? Cannot they take care of themselves as they have for centuries, without the necessity of having a high-salaried official to look after them? Our trees looked better twenty years ago, and with less care than they now have. Why is it?"

The answer is plain to one versed in the progress of modern events. Our entire mode of living has changed in the past half century; we live faster, we require more in everything. We are not satisfied with what we have been blessed with naturally but we wish for everything that we see others have. This same holds true about trees. We have not been satisfied with the species we find growing here naturally. We wish for some we have seen in Europe, Japan or China. This is only natural; it simply coincides with the progress of things in every branch of life. To satisfy this we have imported foreign trees, shrubs and flowers, and with these foreign plants we have also imported foreign diseases, which in their native countries are not fatal, as nature has there established a balance, and created parasites which in turn keep the pests down and preserve the trees. This sudden change, however, of the insect or disease from one climate to another often kills the parasite, or it is not imported, while the disease itself enters and becomes fatal to our trees. This accounts for practically all of our worst tree pests. The gypsy moth, brown-tail moth,

elm-leaf beetle, San José scale, leopard moth, probably chestnut blight disease and others have all been imported from some foreign country through our greed to have everything that some one else possesses.

The insect problem, nevertheless, has in a way been a benefit to us. It has brought to the notice of the people in general, through actual experience, the fact that a city or town without shade trees is a pretty poor place to live in. It has made them observe their trees, and has caused certain people to awake to the fact that trees, like any other living thing, cannot be set down in artificial conditions and expected to live on forever without some kind of nourishment and care.

There are a number of other items that enter into the cause of decline of our shade trees in the past quarter century, and especially so in our cities. The shade tree in most of our modern cities has a very hard life to live. Practically all the conditions under which it is forced to grow are entirely foreign to its natural element. The soil usually is not as good; it has in most cases been impoverished by continued use for agricultural purposes before it was cut up into building lots. In many cases the land has been made by filling in with ashes, stones and other refuse. In other cases the rich top soil has been removed to enable a grade to be established, the tree being set out originally in poor soil and handicapped from the very start. To add to this handicap, the atmospheric conditions are much different from what they used to be. The air is full of smoke, dust from oiled streets and noxious gases from various manufacturing plants. All these choke the lungs of the tree (its leaves) and cut off its supply of pure air. Add to this the fact that its roots are cut off when the road is regraded, again when the sidewalk is put in; that a tar or cement sidewalk and a macadam or paved street is put in around its roots and its water supply cut off. Then what chance has the poor tree of living?

To meet all these conditions the tree has to change its way of growing many times, and becomes almost an entirely different tree from the same species growing under natural conditions. Some species are not capable of doing this, and will therefore die and have to be removed. It has become necessary for us therefore to make a study of the species most capable of living under these adverse conditions and to replace the less desirable ones with these.

When a tree has all it can do to obtain nourishment enough to live on, it does not take much of a setback to allow the entrance of some disease, which once started quickly weakens the tree, allowing other diseases to take hold, which, combined, quickly prove fatal.

The familiar stag-headed effect, *i.e.*, the top of the trees dying, leaving only the lower limbs alive and green, is caused in most cases from lack of nourishment and moisture. This lack of moisture is not always caused from the absence of the proper elements in the soil, but from the weakening of the tree to such an extent that it is unable to assimilate it. The past few very dry summers have had their effect on the shade trees of all localities, and especially so with us on account of our topography. The dry,

hot summer has almost stopped growth in the tree, and then the fall rains have stimulated a late addition of cells which have not had time to properly harden off before the extreme cold weather has set in. This has caused a severe case of winterkilling of these new cells, resulting in the death of portions of the roots, thereby cutting down their ability to supply food to the tree and resulting in turn in the dying of the tops.

This condition has repeated itself, for several years and is, of course, something that cannot be helped, but the resulting condition of the trees can be aided by the proper care.

These are things liable to happen to perfectly healthy trees and those that have had the best of care, but in the case of the trees where no care has been taken, we find them to be in very poor condition to withstand it.

To give a concrete example of what may be accomplished along these lines, I am going to tell you what we have done in a small way here in Fitchburg.

In the tree directory kept by the city forestry department, it is shown that we have 1,937 trees belonging to the city or within the limits of the highway boundaries in the city proper. Of this number, 254 only are classed as perfect tops and 420 are perfect trunks, 577 are good tops and 597 good trunks, while 1,086 tops and 896 trunks are below that classed as poor or in bad condition.

Of the same number of trees we find the following defects present: 166 have cavities of more or less size which need tinning or cementing to keep the gypsy moth out and to prevent fungous diseases from entering; 26 have crotches or bad forks that need bracing by means of bolts or chains to ensure them against splitting; 180 have injuries of a more or less serious nature that need attention; 42 have boiler plate guards that are now injuring the trees and should be removed; 115 have wire guards that have been imbedded in the growing tree until they are girdling and killing it. Of the entire number of street trees only 289 have guards of any kind, and 173 of these need removing, so that practically all of our shade trees that stand near the curbing need new wire guards. Besides this work, many of the trees listed as dying or in poor or bad condition are in need of rejuvenation.

To give an illustration to the people of our city of what could and should be done with all shade trees in the city, the local branch of the Massachusetts Forestry Association made available a sum of money for our department which they stipulated was to be used on a certain street to put the trees there in the best possible condition under the circumstances.

A street was picked out that was centrally located and on which there were 29 trees, ranging in diameter from 15 to 25 inches and composed of 21 sugar maples, 6 American elms, 1 horse chestnut and 1 American linden. Not one of these trees was classified in our census as perfect, but a majority of them was in good or fair condition and 7 of them were in poor condition.

It was our aim to put all these trees in such condition that we could reclassify them as very good or perfect.

In order to do this we removed all the dead or dying limbs, cut off superfluous branches, and shaped the tree so that it would conform with its

neighbors as near as possible; chained together limbs that were in danger of splitting off in a heavy wind storm; removed the boiler plates and old wire guards that had outgrown their usefulness; opened up all cavities, cleaned out all the dead wood and refilled them; and lastly, removed the curbing and sidewalk that were choking the root and trunk growth of the tree, and put on new guards.

The first operation of removing the dead limbs is a very simple one, and one that every one has seen done many times. In this, however, and also when we remove the live limbs, great care is taken to make the cut as close to the trunk of the tree as possible, and to have it cut parallel to the axis of the tree. After the cut is made the resulting wound is carefully covered with tar, to prevent water and air from getting into the freshly exposed wood and starting decay anew.

The shaping of the tree is something that has to be left to the judgment of the foreman, as the conditions under which the tree is growing enter into the case very largely, and no set rule can be laid down.

After the tree has been relieved of its dead wood, and enough live wood removed to shape it as wanted, all the remaining limbs are carefully looked over for defects. If we find any cavities in them they are scraped out and cement put in, or the inside treated with creosote and then a piece of zinc or tin cut to exactly fit this hole and nailed over it, after being tarred on both sides to prevent the moisture from the live wood rusting it. If the limb is particularly weakened after the dead tissue is removed, then cement is usually used instead of tin, as this adds strength to the limb.

In many cases these limbs where they leave the main body of the tree are particularly weak (some have already started to crack), and show to the expert eye that they need bracing, in order to prevent them from splitting off during some wild storm and possibly injuring some passer-by, thereby causing not only inconvenience to some of our citizens but also the danger of the added expense of a lawsuit to the city. In order to prevent this, when we find a limb that in our opinion is dangerous it is braced by means of chains connecting it with some other stronger limb or with the main trunk. These chains are attached to the tree or limb by means of bolts or lugs set into the wood, and the chain attached to the bolts and not to the tree itself. This has the effect of holding the limbs in the position they are meant to assume, and yet it does not prevent them from swinging in the wind to some extent.

The old boiler plates and wire guards that were once attached to the trunks of the trees have in most cases long since passed their usefulness and now need to be removed. In the case of the wire guards, they were firmly nailed to the trunk of the tree, and as the tree has continued to grow the wire has naturally remained stationary, and therefore has become imbedded in the living tissue of the trunk. This has to be removed, or the tree stands in danger of being girdled or of being injured to such an extent that fungous and other diseases can find a lodgment and form new cavities. This same has been true, to a certain extent, with the boiler plate guards; they have become imbedded in the tree oftentimes

to such an extent that it is almost impossible to remove them. In addition to this trouble we have the danger of water settling behind these guards and causing serious decay; it is also an ideal lodging place for insects of all kinds, especially the gypsy moth. All these guards have been removed, and where it was found necessary the cavities behind them treated in the proper manner.

The method used in treating all the cavities was to remove every sign of decayed and decaying wood; then in case of a large cavity staples are driven into the wood near the edge of the wound and a wire screen cut to fit the opening fastened into place. A small space is reserved at the top, through which the first installment of cement is poured, this consists of a composition of cement, sand and coarse gravel. After this has set, the outside dressing of fine cement and sand is applied and the finishing touches are added. Great care has to be taken here not to have the cement overlap the cambium layer or growing part of the tree. After this has thoroughly set the whole thing is painted with tar. Before the cement is run into the hole, the wood is treated with creosote, to prevent its attack by the fungous ant, and to kill any that may not have been reached when the dead wood was being removed.

The last operation that we have had to do in the case of these trees is to place new wire guards around them, to remove the curbing where it is pressing too close to the tree and to remove the sidewalk for a given number of square inches around its base. From this place all the cobblestones and other refuse that have been used in construction of the sidewalk is removed and a fresh supply of loam put in its place. This gives the tree a chance to expand and grow, and a chance for a small amount of water and air to penetrate the earth. As a tree needs both of these elements for its continued health, we have done just so much more towards its accomplishment, and probably added several years of life to these trees.

All this work not only prolongs the life of the trees themselves but adds to the health and beauty of this street. Trees are not only beautiful to look at (when properly cared for), and an addition to any street, but are in themselves an addition to the health of that street, as they take up carbon dioxide and other noxious gases from the air, and after breaking this up and absorbing the carbon to make cellulose for their own tissue building, they give back to the atmosphere pure oxygen. They are also great equalizers of temperature, making it warmer in winter and cooler in summer, because of the great amount of water transpired through their leaves and cells. They are a benefit to the city which takes good care of them because they attract outsiders, and often are the cause of bringing new industries to your city.

So much for the shade-tree problem of a city forester. Besides this so-called tree surgery work, there are a number of diseases and insect pests to be handled and preventive methods used in caring for them.

Where the elm-leaf beetle is established, or where gypsy or brown-tail moths have obtained a foothold, a power sprayer outfit is very essential,



A large cavity filled with cement and cobble stones, forming a cheap and serviceable filling.



Cavity in old apple tree cleaned out and covered with zinc. A hiding place for the gypsy moth closed. Note the new growth of one season covering the edges.

and a well-defined spraying campaign should be carried out from early spring, when it is advisable to spray for scale insects, until August, when the most effective work can be accomplished against the brown-tail.

In carrying on the work against the gypsy moth, we divide it into two divisions, orchard and woodland work, each of which has its separate methods of procedure and is in turn divided into three classes of work.

Of course, the first object is to get the owner to do his own work and do it intelligently, but where this cannot be accomplished, we take the following method. If it be an orchard, our first work is to remove the worthless trees and then put the remaining ones in the best possible condition to withstand the pests. This can be done by removing the dead wood and closing all cavities within by means of the tin or zinc method, or cement. There are several methods of cementing which are cheaper but not as lasting as the ones described previously. A picture of one method is shown in this report. The large cavity is simply hurriedly cleaned of decayed matter and the outside edges pared down to give a free exposure of the cambium, then the cavity is filled with a composition of cement, sand and large stones, care being taken, of course, not to remove the cement composition over the cambium layer. The whole thing is then painted with tar. This affords a cheap filling for large cavities and at the same time prevents the laying of eggs out of sight or where they cannot be easily treated. Smaller cavities are treated as illustrated elsewhere in this report.

After the orchard has been put into this condition the owner is instructed to hunt the eggs of the gypsy moth and treat them with creosote, or the city does the work.

Owing to the topography of our city, and the great amount of loose stones, retaining walls and old stone walls, it is impossible to locate and treat all the egg clusters deposited, and a continuous infestation is therefore resulting, in spite of the elimination of the hollow trees. It therefore becomes necessary to use other means of holding them in check. For this reason spraying of orchards is advised, and the additional use of tanglefoot on the trees where they adjoin woodland infested with gypsy moths.

In the case of woodland, we advise also the removal of worthless specimens, or, in other words, an improvement thinning adapted to gypsy moth conditions. For this purpose we have published a list of trees which are more or less resistant to the gypsy moth and those nonresistant. It is then our policy in every case possible to remove not only suppressed and worthless trees, but also the nonresistant species.

Two examples of this work we conducted in our city last year. The first covered an area of about 6 acres and the second 50 acres. In the first case the work was done at a profit to the owner of some \$200, and in the second case, where a considerable area of pine thinnings was made also, a profit of \$1,300 was realized.

In the second stage of work in the case of woodland it does not seem profitable to go over the trees with creosote or use the tanglefoot only in rare instances, but spraying is conducted extensively.

In addition to the above-stated methods, which I designate as hand methods, we are relying mostly for the controlling of the gypsy moths in the wood on the free use of diseases and parasites. In this latter method is our only hope for the future in controlling the pests.

In conclusion, I would say that I believe one of the important duties of the forester in cities of Massachusetts where we have such narrow streets is to see that through proper co-operation with land companies and the city departments the future plans for improvements on streets and the laying out of new ones should give attention to the establishing of a space for shade trees between the curb and the sidewalk. This gives a much more satisfactory effect and uniformity of planting to street trees, and at the same time affords the tree a much better chance of thriving than under the present conditions, where they are oftentimes placed partly in the street and partly in the sidewalk, or, in some cases, in the very middle of the sidewalk itself.

As shade trees have been proved to be a distinct addition to a city, together with increasing the value of property abutting, it would seem to be a good investment for any city or group of towns to employ the services of a trained forester, who can look after their interests not alone in regard to shade trees, but for the establishment of municipal forests for a future revenue.

LECTURES AND ADDRESSES.

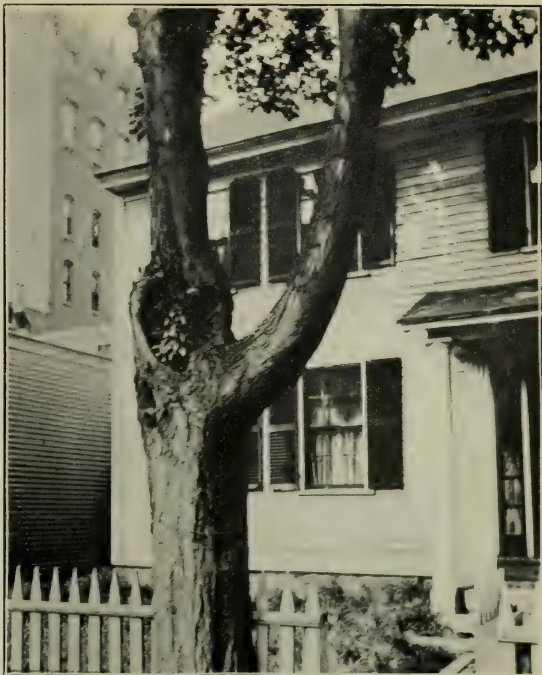
The State Forester has had the usual number of requests for engagements in the State and abroad, but his time has been so fully taken up that it has been impossible to do as much of this work as usual throughout the year.

The usual lectures on the State forest policy were given before the students at the Massachusetts Agricultural College during the winter.

The following organizations were addressed during the year:—

West Hampden Pomona Grange.
Norfolk Men's Association.
Worcester Horticultural Society.
Chicopee Board of Trade.
Men's Club, Hopedale.
Aberdeen Club.
Needham Farmers and Mechanics Club.
New Century Club, Mansfield.
Massachusetts Forestry Association.
Springfield Fish and Game Club.
Young Men's Christian Union.
State Board of Agriculture.
Taxation Convention.

District Fire Meeting, Walpole.
Economic Club.
Cape Ann Scientific and Literary Association.
Farmers' Institute, Warwick.
Massachusetts Agricultural College.
Chestnut Blight Convention, Harrisburg, Pa.
Boston Market Gardeners' Association.
St. James Men's Club, Roxbury.
Berkshire Public Lecture, Pittsfield.
Natural History Museum, Science Teachers.



One of the many trees in need of immediate attention.



Properly pruning and treating a street tree (elm). Trimming crew at top of 36-foot ladder; foreman at foot.

Pomona Grange, Medway.
Canton Lecture Course.
Fitchburg City Government.
Newton Men's Club.
Northfield Grange.
Grange, Southborough.
Amesbury Park Association.
Norfolk County Associated Board of
Trade.
Public Meeting, Great Barrington.
Old Colony Pomona Grange, Easton.
State Grange Field Day, Monterey.

Old Colony Pomona, Dartmouth.
Cape Ann Literary and Scientific So-
ciety, Gloucester.
State Grange Field Day, Montague.
Pomona Grange, Billerica.
Men's Club, Hopedale.
Citizens' Meeting, Carver.
Firemen's Muster, Hanover.
State Grange Field Day, Pembroke.
Arbor Day Exercises, Winthrop.
State Grange Field Day, Templeton.
New England Tax Association.

FIELD MEETINGS OF THE STATE GRANGE.

No more potent factor exists for the uplift of humanity and the promotion and advancement of all contributory agencies to material prosperity in rural communities than the work of the order known throughout the country as the Patrons of Husbandry. Nearly every town and village in Massachusetts has its grange hall, where at stated intervals the members of the order gather and discuss questions of importance relating to the welfare of the nation, State or their local communities. The objects of the order are to aid in the development of everything which may add to the wealth and power of the nation, and bring to its people the fullest measure of comfort and happiness. In order to stimulate the interest of its members in all movements for the betterment of economic conditions in Massachusetts, the State master, Charles M. Gardner, this year arranged for and held a series of field meetings that were addressed by representatives of various State departments, each of whom spoke in detail of the work of his department. The State Forester's office was represented by the secretary, Charles O. Bailey, at the meetings held at Pembroke, Greenwich Village, Montague, Templeton, Monterey, Blandford, Sunderland and Dartmouth. The work of reforestation, the development of the forest fire system, and other branches of forestry were discussed by the speaker, and the decidedly marked interest manifested by the audience at each meeting was extremely gratifying, and must be regarded as an indication of the enthusiastic favor with which the forestry movement is held generally by the people of the Commonwealth.

FOURTH NATIONAL CONSERVATION CONGRESS.

The Fourth National Conservation Congress met at Indianapolis, Ind., October 1 to 4, and the State Forester was appointed a delegate by Governor Foss.

The Congress was a success, and from the forestry standpoint interest was aroused that promises for even greater accomplishments at future meetings. The lumbermen were well represented. Many of the State officials in forestry lines were present, and the work along forest fire protection and management was fully discussed.

While at this convention I was particularly fortunate in having an opportunity to go over the data accumulated by the Indiana State Forester relating to the catalpa tree. This tree is indigenous to Indiana. There has been so much written about it as being a tree well adapted to general forestry uses, particularly the *catalpa speciosa*, that I was pleased to obtain information I have much wished for. I find that this species, even in Indiana, is not considered commercially as valuable as many would make it. This corroborates our experience thus far with the catalpa in Massachusetts. We have several examples where the catalpa plantations have proved a failure.

MEETING OF EASTERN FORESTERS.

A meeting of the organization known as the Eastern Foresters, which is composed of the State officials and others engaged in teaching or professional forestry work in the eastern States, was held July 15 and 16 at Petersham, Mass., at the invitation of Professor Fisher of the Harvard Forest School. It proved to be the largest gathering ever held of the members, and the occasion gave an opportunity to study the Harvard forestry school methods and discuss State forest policies.

FINANCIAL STATEMENTS.

General Forestry.

In accordance with section 6, chapter 409 of the Acts of 1904, as amended by section 1, chapter 473 of the Acts of 1907, the following statement is given of the forestry expenditures for the year ending Nov. 30, 1912: —

Salaries of assistants,	\$5,611 42
Traveling expenses,	1,431 85
Stationery, postage and other office supplies,	1,191 79
Printing,	461 57
Nursery account,	5,270 57
Sundries,	29 44
	<hr/>
	\$13,996 64

Reforestation.

Labor,	\$6,042 22
Land,	1,250 90
Trees,	619 88
Tools and equipment,	350 83
Travel,	1,162 07
Express,	491 34
Sundries,	73 05
	<hr/>
	\$9,990 29

Forest Fire Prevention.

Salaries,	\$5,341 14
Travel,	1,591 22
Printing,	1,066 85
Stationery, postage and other office supplies,	339 07
Express,	68 59
Equipment,	1,115 22
Construction,	814 88
Telephone,	322 70
Sundries,	5 74
	<hr/>
	\$10,665 41

Miscellaneous.

Salaries,	\$5,095 46
Travel,	2,726 00
Printing,	168 24
Stationery, postage, and other office supplies,	128 29
Express,	102 35
Equipment,	257 51
Construction,	372 49
Telephone,	482 36
Sundries,	1 63
	<hr/>
	\$9,334 33

Reimbursement to towns for fire-fighting apparatus \$4,989.99.

Moth Work.

The balance shown on the general appropriation for suppression work will be greatly reduced by reimbursements to cities and towns which have not yet made returns to this office of their final expenses for the year.

GENERAL APPROPRIATION.

Balance on hand Nov. 30, 1911,	\$116,103 44
Less reimbursement due for 1911,	68,661 37

Balance for 1912 work,	\$47,442 07
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Receipts:—

Appropriation for 1912,	150,000 00 ✓
Town of Natick,	479 77 ✓
Town of Great Barrington,	157 00 ✓
Town of Rowley,	619 28 ✓
Town of Norwell,	179 73 ✓
Town of Hingham,	10 48 ✓
Appropriation of Feb. 20, 1912,	100,000 00 ✓
Town of Milton,	2,510 34 ✓
Town of Wakefield,	658 37 ✓
Town of Rockport,	126 95 ✓
Town of Needham,	432 52 ✓
Boston Brick Company,	526 89 ✓
Transfer forest fire appropriation,	16 47 ✓
Transfer forestry appropriation,	43 28 ✓
Transfer reforestation appropriation,	215 49 ✓
Transfer special North Shore fund,	14,389 08 ✓
Transfer special South Shore fund,	16 49 ✓
City of Marlborough,	679 25 ✓
Chas. H. Chaplin for wood,	33 00 ✓
Miss M. R. Case for work in Weston,	211 90 ✓
Town of Topsfield,	559 61 ✓
J. D. Barnes,	30 00 ✓
	<hr/>
	\$319,337 97

Office expenses:—

Salaries of clerks,	\$2,598 91
Rent of offices,	2,621 66
Stationery and postage,	945 12
Printing,	1,566 93
Office and laboratory supplies,	653 21
Office and laboratory sundries,	714 30

<i>Amounts carried forward,</i>	\$9,100 13	\$319,337 97
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Amounts brought forward, \$9,100 13 \$319,337 97

Field expenses: —

Wages of employees,	29,777 19	
Traveling expenses,	12,513 31	
Tools and supplies,	107,281 22	
Special work,	17,500 00	
Rent of supply store,	745 83	
Rent of shop,	250 00	
Equipment at store,	185 47	
Sundries, including teaming,	3,467 65	
Reimbursement to towns and cities,	35,343 17	
		216,163 97

Balance,	\$103,174 00
Appropriation for 1913,	75,000 00

Balance on hand Nov. 30, 1912,	\$178,174 00
Reimbursement for 1912, paid in December, 1912, and January, 1913,	61,016 06

Balance carried to 1913, for year 1913, including \$75,000 appropriated in 1912,	\$117,157 94
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SPECIAL NORTH SHORE FUND.

Receipts.

Balance from 1911,	\$1,412 46 ✓	
Deposit by F. W. Rane, State Forester,	5,000 00 ✓	
Deposit by W. D. Sohler, agent,	5,000 00 ✓	
Deposit by city of Beverly,	5,000 00 ✓	
Deposit by W. D. Sohler, agent,	5,000 00 ✓	
Deposit by town of Manchester,	5,000 00 ✓	
Deposit by W. D. Sohler, agent,	5,000 00 ✓	
Deposit by F. W. Rane, State Forester,	12,500 00 ✓	
Deposit by W. D. Sohler, agent,	2,500 00 ✓	
Cash received for work on private estates,	5,147 30	
		\$51,559 76

Expenditures.

Wages of employees,	\$29,319 56	
Traveling expenses,	1,289 36	
Rent,	221 00	
Supplies,	14,930 81	
Stationery and postage,	7 95	
Sundries, including teaming, etc.,	2,109 03	
		47,877 71

Balance on hand Nov. 30, 1912,	\$3,682 05
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SPECIAL SOUTH SHORE FUND.

Receipts.

Balance from 1911,	\$107 68
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Expenditures.

Field supplies,	\$16 49
Field sundries,	25 00
	<hr/>
	41 49

Balance on hand Nov. 30, 1912,	\$66 19
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The following is a list of towns and cities, with amount of supplies for moth work furnished for the year ending Nov. 30, 1912: —

Acton,	\$302 77	Halifax,	\$7 31
Andover, ¹	2,543 15	Hamilton,	800 81
Arlington,	1,306 03	Hanover, ¹	2,026 04
Ashburnham,	32 64	Hanson,	137 54
Ashby,	52 45	Harvard,	439 66
Ashland,	87 49	Hingham,	1,240 35
Avon,	59 65	Holden,	72
Bedford,	1,801 59	Hopkinton,	58 82
Berkley,	21 48	Hubbardston,	19 26
Berlin,	68 96	Hudson,	81 23
Billerica,	458 23	Ipswich, ¹	2,300 70
Bolton,	139 55	Kingston, ¹	1,091 69
Boston,	7 20	Lancaster,	51
Boxborough,	318 55	Lenox,	72
Boxford,	212 00	Lexington,	1,425 61
Boylston,	28 74	Lincoln,	1,989 13
Burlington,	410 47	Littleton,	279 55
Canton,	1,408 56	Lowell,	22 14
Carlisle,	525 62	Lunenburg,	142 98
Carver, ¹	1,099 10	Lynn, ¹	1,361 72
Chelmsford,	650 92	Lynnfield, ¹	2,489 82
Cohasset, ¹	3,446 51	Marlborough, ¹	1,596 23
Concord,	1,014 57	Marshfield, ¹	2,356 49
Danvers,	447 46	Mashpee,	56 87
Dracut, ¹	1,851 12	Medford,	1,223 62
Dunstable,	122 43	Merrimac,	129 91
Duxbury, ¹	1,034 02	Methuen,	767 24
East Bridgewater,	6 43	Middleborough,	279 16
Easton, ¹	1,658 40	Middleton,	275 59
Essex,	95 55	Milton,	2,673 78
Fitchburg,	3 24	Natick,	48 15
Georgetown,	504 41	Newbury, ¹	2,181 07
Gloucester,	767 33	Newton, ¹	7,332 99
Great Barrington,	72	Norfolk,	176 97
Groton, ¹	2,033 58	North Andover,	655 34
Groveland,	154 80	North Reading,	974 30

¹ Received sprayers from the State, agreeing to pay one-half the cost.

Northborough,	\$56 50	Stoughton,	\$0 86
Norwell,	660 68	Stow,	227 12
Paxton,	6 84	Sudbury, ¹	1,978 38
Pembroke,	148 66	Tewksbury, ¹	1,994 84
Pepperell, ¹	1,895 23	Topsfield,	433 16
Phillipston,	6 84	Townsend, ¹	1,782 00
Plympton,	76 55	Tyngsborough,	187 35
Princeton,	18 54	Wakefield,	959 48
Quincy,	1,225 11	Walpole, ¹	1,629 76
Raynham,	25 67	Waltham, ¹	3,189 22
Reading,	1,569 93	Wayland, ¹	2,629 30
Rockport,	16 18	Wenham,	991 63
Rowley,	1,180 71	West Bridgewater, ¹	1,752 33
Royalston,	23 80	West Newbury,	303 80
Salisbury,	203 24	Westborough,	13 76
Sandwich,	34 10	Westford,	465 57
Saugus,	1,599 57	Westminster,	16 72
Scituate,	1,749 02	Weston,	2,618 95
Sherborn,	385 03	Westwood, ¹	1,628 30
Shirley, ¹	1,936 42	Wilmington,	1,017 18
Shrewsbury,	2 61	Winchester, ¹	1,970 77
Southborough,	237 10	Woburn,	1,290 31
Sterling,	1,675 31		
Stoneham, ¹	2,176 34		\$105,310 51
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Cities and towns,			\$105,402 33
Experimental work,			23 77
Forestry department,			43 28
Forest fire prevention,			16 47
Malden Hospital,			29 50
North Shore fund,			16,389 08
Pine Banks,			159 43
Reforestation,			215 49
South Shore fund,			16 49
Traveling pump,			5 82
Traveling sprayer, (1),			21 56
Traveling sprayer, (2),			1 25
Traveling sprayer, (3),			54 33
Traveling sprayer, (4),			226 58
Traveling sprayer, (5),			13 53
Traveling sprayer, (6),			50 14
Traveling sprayer, (7),			172 32
United States Department of Agriculture,			34 65
<hr/>			
			\$122,784 20

FINANCIAL SUMMARY BY TOWNS OF MOTH WORK.

The following table shows the reimbursement paid to cities and towns for the year 1911, the total net expenditure, the required expenditure before receiving reimbursement from the State, the amount of work on private property returned to this office, and the amount of reimbursement paid for 1912, with the required expenditure for 1913.

¹ Received sprayers from the State, agreeing to pay one-half the cost.

Towns and cities having an asterisk (*) against the amount of reimbursement for 1911 and 1912 also received supplies from the State supply store, as per list printed on page 87 in annual report for 1911 and on page 98 in this year's report.

CITIES AND TOWNS.	1911. Re- imburse- ment.	1912.				1913. Required Expendi- ture.
		Required Expendi- ture.	Total Net Expendi- ture.	Private Work.	Re- imburse- ment.	
Abington,	-	\$1,311 93	-	-	-	\$1,361 05
Acton,	\$1,002 88*	915 40	\$1,913 25	\$332 50	\$997 85*	970 13
Acushnet,	-	382 38	-	-	-	402 86
Amesbury,	-	2,546 82	2,144 22	891 23	-	2,615 03
Andover,	759 87*	2,873 89	3,455 40	1,670 38	-*	2,883 11
Arlington,	21 81*	5,000 00	4,070 37	1,770 98	-*	5,000 00
Ashburnham,	-*	421 21	525 96	325 81	104 75*	488 17
Ashby,	232 33*	232 92	466 40	69 16	233 48*	239 32
Ashland,	69 13*	515 79	759 57	173 12	243 78*	585 00
Athol,	-	1,967 57	-	-	-	2,216 99
Attleborough,	-	5,000 00	-	-	-	5,000 00
Auburn,	-	537 60	-	-	-	554 00
Avon,	67 17*	396 94	518 96	108 71	122 02*	414 70
Ayer,	-	890 99	844 26	31 70	-	922 45
Barnstable,	-	3,150 59	-	-	-	3,175 20
Barre,	-	910 96	-	-	-	1,001 02
Bedford,	2,464 26*	600 77	2,897 57	1,886 33	2,296 80*	667 80
Bellingham,	-	373 67	-	-	-	383 65
Belmont,	572 26*	2,757 03	1,832 61	1,576 00	-	3,015 78
Berkley,	-	162 46	259 68	47 87	97 22*	165 77
Berlin,	881 82*	239 68	1,248 95	393 64	1,009 27*	243 10
Beverly,	316 83	5,000 00	4,544 26	1,979 52	-	5,000 00
Billerica,	651 75*	1,025 97	1,880 86	458 01	854 89*	1,132 00
Blackstone,	-	944 55	-	-	-	948 29
Bolton,	237 10*	234 32	1,107 08	114 95	872 76*	258 98
Boston,	20,000 00*	5,000 00	47,851 69	17,817 90	20,000 00*	5,000 00
Bourne,	-	2,277 02	-	-	-	2,881 49
Boxborough,	1,406 11*	114 43	1,436 42	111 36	1,321 99*	116 41
Boxford,	1,684 58*	586 74	2,638 94	329 03	2,052 20*	610 32
Boylston,	-	206 91	210 85 ¹	191 70	-*	207 40
Braintree,	-	2,677 95	-	-	-	3,163 39
Brewster,	-	341 88	-	-	-	354 44

¹ No papers filed.

CITIES AND TOWNS.	1911. Re- imburse- ment.	1912.				1913. Required Expendi- ture.
		Required Expendi- ture.	Total Net Expendi- ture.	Private Work.	Re- imburse- ment.	
Bridgewater,	\$280 69*	\$1,420 72	\$1,123 90	\$276 42	-	\$1,447 26
Brockton,	-	5,000 00	-	-	-	5,000 00
Brookfield,	-	546 68	-	-	-	541 40
Brookline,	-*	5,000 00	-	-	-	5,000 00
Burlington,	2,310 25*	293 94	1,790 52	163 75	\$1,496 58*	310 18
Cambridge,	-	5,000 00	-	-	-	5,000 00
Canton,	1,154 91*	2,044 39	2,336 35	1,469 47	291 96*	2,133 36
Carlisle,	2,373 26*	193 85	2,986 10	242 16	2,792 25*	191 37
Carver,	95 66*	808 23	1,623 05	440 24	489 82*	770 99
Charlton,	-*	539 58	-	-	-	522 40
Chelmsford,	464 74*	1,688 17	2,188 88	1,065 73	500 71*	1,753 60
Chelsea,	-	5,000 00	-	-	-	5,000 00
Clinton,	-	3,522 98	2,253 31	-	-	3,632 43
Cohasset,	1,153 29*	3,997 11	6,573 60	2,074 00	1,011 89*	3,802 02
Concord,	1,351 23*	3,088 80	4,724 04	2,469 97	1,105 28*	3,372 27
Danvers,	2,479 43*	2,644 15	4,377 42	1,393 52	1,297 13*	2,792 62
Dedham,	-	5,000 00	-	-	-	5,000 00
Dennis,	-	516 50	-	-	-	530 67
Douglas,	-	542 80	-	-	-	551 50
Dover,	954 89	2,347 82	- ¹	-	-	2,515 57
Dracut,	878 45*	990 92	1,888 24	956 25	297 32*	1,013 87
Dudley,	-	766 99	-	-	-	794 74
Dunstable,	878 77*	193 81	990 52	265 80	796 71*	170 36
Duxbury,	208 03*	948 11	1,530 81	718 42	257 70*	1,268 83
East Bridgewater, . .	399 63*	897 49	954 03	275 58	56 54*	903 05
Easton,	-	2,395 75	2,725 42	1,141 09	-*	2,403 14
Essex,	850 23*	524 64	1,127 95	418 75	603 31*	496 97
Everett,	-	5,000 00	1,830 06	-	-	5,000 00
Fairhaven,	-	1,509 81	-	-	-	1,554 84
Falmouth,	-	3,604 88	-	-	-	4,718 70
Fitchburg,	-*	5,000 00	-	-	-*	5,000 00
Foxborough,	-	985 74	-	-	-	1,033 04
Framingham,	-	5,000 00	3,444 23	-	-	5,000 00
Franklin,	-	1,731 40	-	-	-	1,773 40
Gardner,	-	3,806 52	-	-	-	4,005 63
Georgetown,	1,516 45*	505 10	1,963 58	678 68	1,458 48*	498 01
Gloucester,	675 33*	5,000 00	9,013 46	2,389 21	1,623 07*	5,000 00

CITIES AND TOWNS.	1911. Re- imburse- ment.	1912.				1913. Required Expendi- ture.
		Required Expendi- ture.	Total Net Expendi- ture.	Private Work.	Re- imburse- ment.	
Grafton,	-	\$1,144 11	-	-	-	\$1,168 22
Great Barrington, . .	-	2,509 28	-	-	-*	2,536 84
Greenfield,	-	4,029 76	-	-	-	4,324 33
Groton,	\$390 12*	1,588 66	\$2,170 36	\$451 01	-*	1,645 19
Groveland,	961 44*	487 34	1,407 67	364 74	\$920 33*	486 64
Halifax,	431 86*	255 53	693 93	499 55	438 40*	260 10
Hamilton,	734 96*	1,728 38	2,763 91	992 82	1,035 53*	1,874 57
Hanover,	760 18*	622 22	2,080 19	627 78	857 97*	638 09
Hanson,	552 58*	531 87	1,448 23	248 76	916 36*	551 32
Harvard,	1,033 69*	630 22	1,164 00	523 80	533 78*	680 53
Haverhill,	108 28*	5,000 00	4,152 27	1,473 88	-	5,000 00
Hingham,	-*	3,140 99	3,254 23	1,606 43	-*	3,116 37
Holbrook,	-	598 23	-	-	-	639 20
Holden,	-	685 23	-	-	-*	712 78
Holliston,	-	791 74	-	-	-	787 43
Hopedale,	-	1,975 15	-	-	-	2,365 45
Hopkinton,	-	655 65	- ¹	- ¹	- ¹ *	702 60
Hubbardston,	-	277 09	-	-	-*	307 48
Hudson,	298 52*	1,589 83	1,839 48	622 93	249 65*	1,618 63
Hull,	-	2,788 01	-	-	-	3,039 23
Ipswich,	1,493 55*	2,257 54	2,831 94	1,185 67	24 40*	2,295 12
Kingston,	495 92*	747 58	1,296 63	463 53	224 05*	660 18
Lakeville,	-	336 06	-	-	-	426 08
Lancaster,	-	1,868 90	-	-	-*	2,140 57
Lawrence,	-	5,000 00	-	-	-	5,000 00
Leicester,	-	976 07	-	-	-	972 41
Lenox,	-	3,065 13	-	-	-*	3,133 87
Leominster,	-*	5,000 00	-	-	-	5,000 00
Lexington,	2,050 34*	3,182 90	6,724 89	1,969 93	2,548 47*	3,242 41
Lincoln,	-*	1,440 09	1,886 36	2,356 19	448 27*	1,615 75
Littleton,	949 82*	459 41	1,336 14	88 80	876 73*	467 63
Lowell,	109 39*	5,000 00	4,133 66	3,439 09	-*	5,000 00
Lunenburg,	661 04*	501 74	1,368 18	692 40	866 44*	534 53
Lynn,	-	5,000 00	1,156 50	3,036 21	-*	5,000 00
Lynnfield,	1,650 93*	437 07	2,226 36	492 98	1,189 29*	479 72
Malden,	-	5,000 00	-	-	-	5,000 00
Manchester,	-	5,000 00	-	-	-	5,000 00

¹ Work financed by State Forester's office.

CITIES AND TOWNS.	1911. Re- imburse- ment.	1912.				1913. Required Expendi- ture.
		Required Expendi- ture.	Total Net Expendi- ture.	Private Work.	Re- imburse- ment.	
Mansfield,	-	\$1,797 57	-	-	-	\$1,672 18
Marblehead,	-	3,700 69	\$2,042 15	\$1,446 75	-	4,079 57
Marion,	-	2,187 92	-	-	-	2,065 46
Marlborough,	-	4,139 61	4,341 89 ¹	-	-*	4,278 62
Marshfield,	\$787 51*	966 60	2,008 77	1,134 17	\$442 17*	1,064 55
Mashpee,	876 87*	94 60	845 33	112 67	750 73*	97 38
Mattapoisett,	-	847 83	-	-	-	798 62
Maynard,	-*	1,593 12	-	-	-	1,632 04
Medfield,	-	649 45	-	-	-	676 33
Medford,	-*	5,000 00	5,846 90	2,776 70	-*	5,000 00
Medway,	-	607 47	413 30	144 00	-	686 51
Melrose,	-	5,000 00	2,113 39	369 90	-	5,000 00
Mendon,	-	290 36	-	-	-	275 44
Merrimac,	778 08*	528 80	1,511 11	287 86	982 31*	535 89
Methuen,	59 92*	3,034 46	3,693 23	2,318 04	373 57*	3,194 64
Middleborough,	719 55*	1,916 35	2,609 47	1,296 42	693 12*	1,939 92
Middleton,	946 80*	340 18	1,629 50	290 13	1,289 32*	354 60
Milford,	-	3,812 48	-	-	-	3,954 62
Millbury,	-	1,123 31	-	-	-	1,193 41
Millis,	-	463 75	-	-	-	539 09
Milton,	-*	5,000 00	4,364 28	9,274 71	-*	5,000 00
Nahant,	-	3,543 50	-	-	-	3,673 72
Natick,	-*	3,312 66	2,605 61	2,172 80	-*	3,479 07
Needham,	-*	2,769 37	2,479 97	1,823 48	-	2,926 47
New Bedford,	-	5,000 00	-	-	-	5,000 00
Newbury,	2,342 80*	524 34	2,262 04	655 92	1,137 70*	627 06
Newburyport,	-	5,000 00	-	-	-	5,000 00
Newton,	5,994 96*	5,000 00	17,621 73	18,725 41	2,644 37*	5,000 00
Norfolk,	-	366 28	602 72	230 56	236 44*	418 44
North Andover,	709 22*	2,163 16	- ²	-	-*	2,211 81
North Attleborough,	-	3,591 39	-	-	-	3,665 74
North Reading,	2,240 51*	299 56	2,228 50	642 86	1,928 94*	354 10
Northborough,	-	557 81	1,347 72	268 78	789 91*	566 66
Northbridge,	-	1,958 94	-	-	-	2,086 30
Norton,	-	555 78	-	-	-	601 74
Norwell,	-*	457 37	860 72	1,461 01	403 35*	446 38
Norwood,	-	5,000 00	-	-	-	5,000 00

¹ No papers filed.² Complete returns not yet filed.

CITIES AND TOWNS.	1911. Re- imburse- ment.	1912.				1913. Required Expendi- ture.
		Required Expendi- ture.	Total Net Expendi- ture.	Private Work.	Re- imburse- ment.	
Oakham,	-	\$147 96	-	-	-	\$152 32
Orange,	-	1,620 19	-	-	-	1,652 94
Orleans,	-	607 60	-	-	-	765 33
Oxford,	-	797 74	-	-	-	820 58
Palmer,	-	1,887 59	-	-	-	1,934 07
Paxton,	-	155 27	-	-	-*	153 36
Peabody,	-	4,824 90	\$6,932 14	\$837 89	\$1,685 79	5,000 00
Pembroke,	\$1,039 19*	383 29	1,749 38	403 54	1,366 09*	390 54
Pepperell,	1,078 70*	923 79	2,004 49	468 35	480 70*	907 45
Petersham,	-	450 91	-	-	-	442 07
Phillipston,	-	116 10	-	-	-*	114 78
Plainville,	-	337 82	-	-	-	342 66
Plymouth,	-	4,720 83	-	-	-	4,886 83
Plympton,	1,246 08*	159 28	1,659 81	237 55	1,500 53*	166 36
Princeton,	-	551 91	-	-	-*	568 21
Provincetown,	-	883 52	-	-	-	915 41
Quincy,	647 75	5,000 00	3,697 12	1,945 64	-*	5,000 00
Randolph,	-	1,033 22	-	-	-	1,092 40
Raynham,	86 50*	318 46	770 57	139 12	452 11*	354 45
Reading,	822 74*	2,537 43	3,459 08	2,415 46	423 33*	2,618 75
Rehoboth,	-	372 53	-	-	-	385 80
Revere,	-	5,000 00	-	-	-	5,000 00
Rochester,	-	290 70	-	-	-	379 92
Rockland,	-	1,765 40	-	-	-	1,931 05
Rockport,	-*	1,464 25	1,910 81	959 00	446 56*	1,512 99
Rowley,	424 70*	1,132 50	1,830 57	134 12	698 07*	968 80
Royalston,	-	282 17	185 21	161 26	-*	278 44
Rutland,	-	318 40	-	-	-	312 59
Salem,	43 25	5,000 00	-	-	-	5,000 00
Salisbury,	1,046 91*	395 21	1,660 50	282 34	1,265 29*	535 99
Sandwich,	150 22*	463 12	620 91	244 12	157 79*	473 83
Saugus,	2,497 56*	2,356 02	5,312 44	1,458 19	2,956 42*	2,537 20
Scituate,	4,199 67*	1,972 23	6,018 60	1,375 00	4,046 37*	2,052 80
Seekonk,	-	566 58	-	-	-	499 89
Sharon,	-	1,284 47	-	-	-	1,287 25
Sherborn,	643 68*	604 25	903 38	895 35	299 13*	644 53
Shirley,	203 93*	491 91	1,127 25	133 80	-*	501 98
Shrewsbury,	-	770 21	-	-	-*	960 50

CITIES AND TOWNS.	1911. Re- imburse- ment.	1912.				1913. Required Expendi- ture.
		Required Expendi- ture.	Total Net Expendi- ture.	Private Work.	Re- imburse- ment.	
Somerville,	-	\$5,000 00	-	-	-	\$5,000 00
Southborough, . . .	\$314 66*	791 73	\$1,473 99	\$1,045 76	\$682 26*	822 60
Spencer,	-	1,412 37	-	-	-	1,459 18
Springfield,	-	5,000 00	-	-	-	5,000 00
Sterling,	665 57*	478 13	1,002 12	212 60	-*	493 86
Stockbridge,	-	1,659 75	-	-	-	1,813 78
Stoneham,	349 50*	2,043 71	- ¹	-	-*	2,104 35
Stoughton,	-	1,459 62	-	-	-*	1,557 35
Stow,	903 91*	414 85	1,333 23	304 64	918 38*	424 82
Sturbridge,	-	440 62	-	-	-	407 65
Sudbury,	1,370 29*	531 46	2,012 08	592 20	880 62*	544 28
Sutton,	-	587 32	-	-	-	618 05
Swampscott,	-	4,728 81	-	-	-	4,955 16
Swansea,	-	666 79	-	-	-	662 11
Taunton,	-	5,000 00	-	-	-	5,000 00
Templeton,	-	673 26	-	-	-	729 96
Tewksbury,	1,266 25*	583 27	1,778 03	570 75	594 76*	605 54
Topsfield,	1,045 21*	857 61	852 13	{ 559 61 1,006 17 }	-2*	1,243 95
Townsend,	365 61*	528 84	1,516 04	322 52	387 20*	538 96
Truro,	-	157 21	-	-	-	157 91
Tyngsborough, . . .	1,480 47*	254 54	1,078 52	1,111 74	823 98*	262 14
Upton,	-	456 76	-	-	-	474 22
Uxbridge,	-	1,473 26	-	-	-	1,413 00
Wakefield,	-*	4,010 72	2,894 61	2,264 76	-*	4,372 26
Walpole,	-	2,391 00	2,370 85	693 80	-*	2,573 82
Waltham,	1,346 21*	5,000 00	8,666 81	5,531 20	238 80*	5,000 00
Wareham,	-	2,087 48	-	-	-	2,212 11
Warren,	-	800 29	-	-	-	840 79
Warwick,	-	179 81	-	-	-	165 89
Watertown,	-	5,000 00	-	-	-	5,000 00
Wayland,	1,044 94*	1,152 62	2,463 55	963 97	710 93*	1,270 83
Webster,	-	3,487 02	-	-	-	3,482 36
Wellesley,	-	5,000 00	5,740 22	2,910 54	370 11	5,000 00
Wellfleet,	-	410 67	-	-	-	407 46
Wenham,	1,577 97*	999 67	1,987 61	726 86	987 04*	1,051 16
West Boylston, . . .	-	353 82	-	-	-	378 60
West Bridgewater, . .	434 48*	561 81	927 37	444 46	-*	613 84
West Newbury, . . .	1,128 34*	425 49	1,444 83	402 23	1,019 34*	423 04

¹ Complete returns not filed yet.² Work financed by State Forester's office.

CITIES AND TOWNS.	1911. Re- imburse- ment.	1912.				1913. Required Expendi- ture.
		Required Expendi- ture.	Total Net Expendi- ture.	Private Work.	Re- imburse- ment.	
Westborough, . . .	-	\$1,311 05	\$1,246 66	\$408 20	-*	\$1,293 07
Westford, . . .	\$1,555 98*	829 36	2,259 31	371 87	\$1,429 95*	859 24
Westminster, . . .	154 49	352 48	482 95	228 95	130 47*	377 73
Weston, . . .	1,354 28*	3,112 89	4,536 95	4,446 02	615 46*	3,359 89
Westwood, . . .	-	1,409 36	1,068 98	294 13	-*	1,641 04
Weymouth, . . .	-	3,461 62	3,472 86	1,519 50	8 99	3,982 86
Whitman, . . .	-	2,172 46	-	-	-	2,215 37
Wilmington, . . .	2,232 16*	642 15	2,694 31	701 07	2,052 16*	683 73
Winchendon, . . .	-	1,659 88	1,154 35 ¹	153 70	-	1,683 77
Winchester, . . .	-	5,000 00	2,313 30	2,560 00	-*	5,000 00
Winthrop, . . .	-	5,000 00	-	-	-	5,000 00
Woburn, . . .	3,509 87*	4,624 55	8,729 52	1,290 66	3,025 92*	4,660 11
Worcester, . . .	-*	5,000 00	-	-	-	5,000 00
Wrentham, . . .	-	541 37	-	-	-	560 48
Yarmouth, . . .	-	942 63	-	-	-	989 19

¹ No papers filed.

LEGISLATION.

Except strengthening and perfecting several of the existing laws by amendments, the last Legislature enacted only one piece of important legislation relating to forestry.

The widespread interest on the part of Massachusetts citizens in the work of reforestation, and the desire of many to utilize their waste lands in the most profitable way, has been followed by a general demand for knowledge regarding the matter of obtaining seedlings, the cost of the same, and, in many cases, complaints on account of inability to purchase them at reasonable prices. These facts prompted the State Forester to consider the advisability of establishing State nurseries on lands owned by the Commonwealth at State institutions, where the labor of the inmates could be used without expense, thus enabling the production of nursery stock at a price well within the means of anybody desiring to purchase it. A bill providing for the creation of such nurseries, under certain conditions, was passed and approved. The act reads as follows: —

AN ACT RELATIVE TO THE ESTABLISHMENT OF FOREST TREE NURSERIES
UPON LAND OF THE COMMONWEALTH.

Be it enacted, etc., as follows:

SECTION 1. Chapter four hundred and nine of the acts of the year nineteen hundred and four is hereby amended by striking out section three and inserting in place thereof the following: — *Section 3.* The state forester may establish and maintain nurseries for the propagation of forest tree seedlings upon such lands of the commonwealth, at the Massachusetts Agricultural College at Amherst, or at any other state institution, as the superintendent or trustees of the institution may set apart for this purpose. Superintendents of institutions where land is set apart for this purpose may furnish free of cost the labor of their inmates necessary to establish and maintain the said nurseries. Seedlings from these nurseries shall be furnished to the commonwealth without expense for use upon reservations set aside for the propagation of forest growths for other than park purposes. All stock grown in nurseries established under the provisions of this act shall be used within the limits of the commonwealth and shall be furnished to state institutions free of charge. The state forester may distribute seeds and seedlings to land owners, citizens of the commonwealth, under such conditions and restrictions as he may determine, subject to the approval of the governor and council.

SECTION 2. This act shall take effect upon its passage. [*Approved May 11, 1912.*]

SUMMARY OF RECOMMENDATIONS OF THE STATE FORESTER.

1. That the general plan suggested and carried out last year regarding the moth work be continued this year, namely, that the appropriation be reduced \$50,000 from last year, making the sum \$200,000 for 1913.

2. That towns having a valuation of \$2,000,000 or less be reimbursed by the State for one-half the expense in fighting forest fires.

3. That an increased appropriation be made to carry on the work of reforestation.

4. That the present forest fire permit law be amended so as to make it apply to all the cities and towns of the Commonwealth.

5. That the office of tree warden in towns be made an appointive office by the selectmen, instead of elective, as at present.

6. That legislation be enacted regulating the disposal of slash or brush, following wood and lumbering operations.

7. That the time of appointment of forest wardens and local moth superintendents be changed from "March or April" to January, in order to give sufficient time to organize for spring work.

8. The passage of a law requiring portable sawmills to be equipped with suitable devices to prevent the escape of sparks or cinders.

Respectfully submitted,

F. W. RANE,
State Forester.

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